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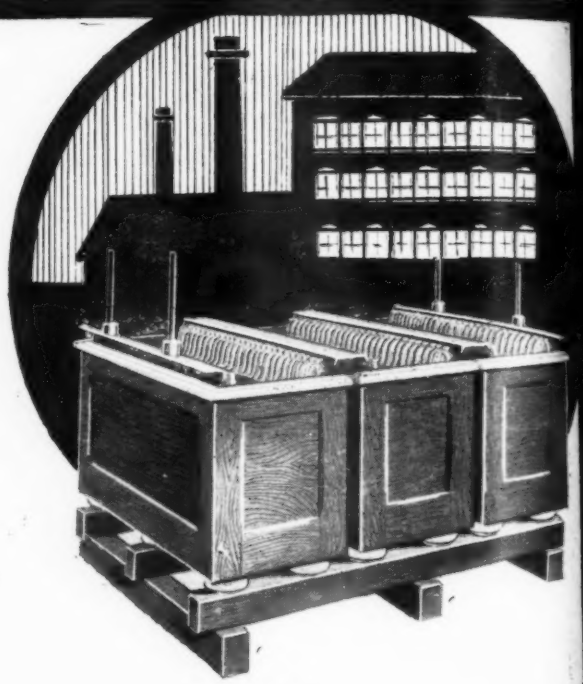

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The

Electrical Review

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London's Electricity Supply Problem.

AS reported on another page, the Electricity Commissioners have concluded their third inquiry into the London electricity scheme, and an Order will be prepared and placed before Parliament in time, it is hoped, for it to receive the Royal Assent this session. The hope has been expressed that it will be possible to proceed sufficiently rapidly to make the agreement between the London County Council and the London companies operative on January 1st, 1925, although it is not contemplated that it will be possible to bring the Joint Electricity Authority into effective existence by that time. These are the hopes, but whether they will be realised is very questionable. There is no disguising the fact that the Commissioners are disappointed with the way things went during the inquiry in many respects, and yet it cannot be denied that they have achieved a very considerable measure of success in bringing the conflicting interests in the large area which has been delimited into close relationship.

The outstanding features of the scheme are that in place of the Company and Local Authority Committees which were the cause of the application to the Courts last year, the large area that has been delimited will, for administrative and financial purposes, be divided into three parts. For instance, what are familiarly known as the London companies, *i.e.*, the provisional order companies which were responsible for the introduction of electricity into London in the early eighties, will work in their areas under an agreement with the London County Council which will extend the tenure of life of the companies for 40 years from 1931, at which date in the ordinary way they would have been purchasable. Under the agreement the companies will have financial and administrative independence. Next there will be a Joint Electricity Authority which, although nominally having jurisdiction over the whole area, will actually have little or nothing to say as regards the companies' areas, at any rate until 1971 when, under the agreement, the companies will be purchasable by the Joint Authority. Thus, the Joint Authority, although comprising representatives of the

companies as well as of the local authorities, will be restricted almost entirely to the control of the local authorities for a long period. Finally, there will be the power companies, such as the North Metropolitan Electric Power Supply Co., the Metropolitan Electric Supply Co., with its power area in western Middlesex, and the two smaller Kent Power Companies, charged with the development of their own areas, although coming to some extent under the jurisdiction—it cannot be said to be control—of the Joint Authority.

That is the outline of the general scheme, to which no great objection was taken. It was with regard to the working details that the trouble arose, and it may be said at once that the Order as it will leave the Commissioners for Parliament will have to be a very different and much less effective instrument than the draft Order which was the subject of the inquiry just concluded. The opposition has arisen mainly at the hands of the local authorities, which appear to be coming under the greatest measure of control of any of the authorities concerned, and it was but natural that they should have watched the proceedings with a very critical eye. The result has been that whereas in the draft order there was a certain measure of compulsion, the amendments which the Commissioners have already conceded under threat of being again taken to the Courts, and also in their desire to arrive at some scheme which will enable a start to be made upon this extraordinarily intricate problem—intricate only by reason of vested interests created by Parliament in the early days—have reduced the scheme to one of such a permissive character as may easily render the whole thing nugatory even now. Apart from other vital considerations, the local authorities in the County of London have flatly told the Commissioners that unless those of their areas which are in the area of supply of a power company—albeit in most cases with an absolute veto in the hands of the local authority—are removed from the power companies' areas, they will oppose the Order when it is made in every possible way and, in the last resort, refuse to elect their representatives on the Joint Electricity Authority. Here we have at least a glimpse of the possibilities.

The last point has yet to be determined, but if we turn to the position at the close of the inquiry and compare it with the position when the draft Order was issued a short time ago, we find some drastic changes. Indeed, we cannot do better than quote a remark made by Sir John Snell to Mr. Turner, counsel for the Conference of Local Authorities, on the last day:— "You have asked us to accept, shall I say, an emasculated technical scheme; you are not prepared to say whether your local authorities are prepared to transfer their stations, and you have even asked us to cut out from the Order any reference to interconnection of the stations; now you go farther and ask us to exclude all your areas from the areas of the power companies without in the least knowing what the technical scheme of the Joint Authority is going to be." If the local authorities did not mince their words in expressing their attitude on certain matters, neither did the Commissioners, and Sir John Snell with some feeling said he could see neither logic nor commonsense in some of the things which the local authorities were asking. The scheme may very well be hung up for a long time, to say the least, on the question of the exclusion of local authority areas from power company areas, for whereas the local authorities assert that they will refuse to elect their representatives on the Joint Authority if their request is not granted, the power companies assert that nothing must be done to interfere with the statutory rights on the strength of which they have spent large sums of money. It is admitted that in certain circumstances the Commissioners have the power to cut out portions of power companies' areas, but apart from the merits of any particular case the Commissioners are faced with the publication by themselves in 1921 of a series of decisions, one of which was that nothing would be done to interfere with existing rights, and the power companies have not overlooked this.

On the other hand, the companies have been much more quiescent at the inquiry than the local authorities, for obvious reasons, and he would be a bold person who would say off-hand that the local authorities are acting in any wilfully obstructive manner. They undoubtedly have genuine fears of being placed in the hands of power companies in some form or other, and the uncompromising fights that have been taking place in the north of London between local authorities and power companies may be sufficient justification for the attitude taken up. For instance, in the case of Hornsey, the complaint is that by reason of the powers of the North Metropolitan Electric Power Supply Co., every time an application is made to the Commissioners for an extension, there is determined opposition from the Power Co., which involves considerable expense and generally hampers the progress of the undertaking. That is the atmosphere which has to be appreciated, and it is one which is all against an amicable settlement in many directions. We can only wish the Commissioners well in their uncommonly difficult task.

The B.T.-H. Report.

At the meeting of the British Thomson-Houston Co., Ltd., held a year ago, the chairman, Mr. H. C. Levis, hesitated to comment on general business conditions, as the position was somewhat obscure and uncertain, though the volume of business had been greater than in the preceding year. The report just issued for 1923 shows that the board has continued its policy of putting down additional factories and equipment in order to keep pace with the unlimited field for progress that the electrical industry presents. For such purposes it has expended £227,000 during the past year. The profit has been £451,778, as against £494,592 for 1922. The dividend on the ordinary shares is 6 per cent., less tax, as compared with 6 per cent., free of tax, a year ago, and the carry-forward is £210,863—£25,808 less than the sum brought in. The same sum is put to reserve as for 1922 (£50,000), but the amount allocated to depreciation of plant is nearly £10,000 larger, and the amount written off cost of converting preference shares is over £11,000 more.

The British Industries Fair.

When arranging the dates for this year's British Industries Fair, the authorities thought that by bringing it forward to May, with more favourable weather conditions, the British Empire Exhibition in being, and other factors, a larger attendance would be assured. The effect, however, was not as anticipated, and the attendance, at least during the first week of the Fair, showed no considerable improvement. Perhaps the weather, which upon the whole behaved very well, was more conducive to holiday-making than to business.

There seemed to be more room at this year's Fair; it was plainly discernible that many firms had dropped out. As regards the electrical industry, defections were not noticeable, for in any case the bulk of the more important electrical firms do not see business in the show. This is a pity, for there are few enough purely trade shows, and the opportunities for business are far more numerous in a Fair of this kind than in the ordinary public exhibition. It may be held as a proof that there is sufficient business to warrant the taking of a stand when the same firms are to be seen at Birmingham year after year

In our opinion the presence of more of the larger companies is necessary for the continuance of the Fairs. If their names are absent from the preliminary lists issued to prospective buyers, there is certain to be less confidence in the show; by becoming exhibitors they not only benefit themselves, but raise the status of the Fair, making it truly a national affair.

The discontinuance of these important Fairs was seriously considered about a year ago. Sir Wm. Joyn-

son-Hicks, then Parliamentary Secretary of the Department of Overseas Trade, said at that time that the Government had no wish to press the Fair upon manufacturers; as an attempt on the part of the Government to foster trade, he thought that it had been successful.

It seems very unwise at the present moment to abandon anything which may contribute to the success of British industry, but it must be remembered that the fate of the Fair is entirely in the hands of the manufacturers themselves; if they decide that it is unnecessary, the country must submit to their judgment. At this year's Fair several large orders have been placed by foreigners, and, in any case, if orders are not always secured on the spot, impressions are gained by visitors. The influence of the Fair is not confined to a fortnight or so of the year.

An Australian E.D.A.

NEWS reaches us from Australia regarding the big electrical development propaganda movement there. The Electricity Development Association has been formed and a paid organiser appointed who was to take up his duties about six weeks ago. According to the information to hand, practically all the big electrical firms are behind the concern. It is stated that as soon as the Association has raised £5,500, the Sydney City Council is to contribute £4,000, and the State Railway Commissioners £500, making a total of £10,000. The intention behind the organisation is forcefully to bring home to the general public the many advantages that electricity possesses beyond those attending its use for street and private lighting. We wish the new Association speedy success in a field which presents abundant opportunities for the popularisation and adoption of domestic labour-saving electrical apparatus.

Earthquake Damage to the Japanese Electrical Industry.

THE American Chargé d'Affaires has been reviewing the effect of the earthquake on Japan's industries. In the course of his report, which has just reached this country, he says that in the destroyed zone there were electrical works which manufactured about 55 per cent. of the electrical machinery and equipment and 30 per cent. of the other machinery produced in Japan. Of the more important manufacturers of electrical machinery, four concerns, employing 5,338 operatives, were practically destroyed, while four others, having 2,161 workmen, escaped with slight damage. The Chargé d'Affaires adds that more than one-half of all the electric light bulbs produced in Japan were made in the earthquake district. The damage is estimated at approximately 15 per cent. of the output in the affected area, or 8 per cent. of the total production.

Callender's Record Profit.

NOT only is a record profit shown in the report of Callender's Cable and Construction Co., Ltd., for the year 1923, but the position as a whole as summarised in the statement is satisfactory. There was a large increase in turnover, keeping the factories well employed, and this activity continues. Owing to keen competition, the ratio of profit has fallen, but the steady inflow of orders and the benefits accruing from up-to-date equipment and methods have produced a balance of £264,086 at credit of profit and loss, as against £251,788 for the previous year. The amount brought forward from 1922 was £226,901, as compared with £150,113 brought in from 1921. This time the directors have still further increased the carry-forward—from £226,901 to £315,987—the dividend on the ordinary shares being continued at 15 per cent.

It is unlikely that shareholders will question the wisdom of the board in thus strengthening the financial position of the company at a time when a good deal of important business lies ahead. The overseas trade, which has long been a strong feature with Callender's, has been considerably extended, and it is pleasing to note that the new Chinese branch is making headway. Anticipations with regard to the extended use of super-pressure cables for interlinking systems at Home promise to be fully justified, trade in rubber-covered wires and cables has considerably improved, and wages questions have been arranged in friendly conference.

The American General Electric Co.

THE annual report of the General Electric Co., of Schenectady, U.S.A., contains figures of business done during the year 1923 which are of interest if only for the vast extent of the operations which they represent. The "net sales billed," for example, reached the colossal total of over 271¼ million dollars, as compared with just under 200¼ millions in 1922. The net income from sales, which in 1922 was 22¾ million dollars, increased in 1923 to well over 29½ millions. The profit available for dividends, converted into sterling, amounted to between six and seven million pounds, as compared with between five and six millions in the previous year. After payment of dividends of 6 per cent. on special stock and 8 per cent. on the common stock, 18½ millions of dollars remain as surplus, as compared with just over 12 millions a year previously. The operations of the International General Electric Co., which are mentioned in the statement, represent orders to the value of $21,743,000, practically the same as in the year 1922. The available balance of the International Co. figures out at nearly 2½ million dollars, an advance of about $200,000 on the result for the preceding year. The costs of the G.E.C. manufacturing plants now in use stand at $169,487,078, but as the general plant reserve and depreciation amount to $111,617,877, they stand at a net value of $57,869,201. A comment respecting the "distinct progress" made in the manufacturing departments may be quoted:—"Notable improvements have been made in internal rearrangement and production processes and methods, which, notwithstanding increased cost of labour and material, have resulted in lower costs, and these have been reflected from time to time in reduced selling prices." The company has purchased a majority of the common stock of the Canadian General Electric Co., Ltd., owing to the decision being reached that a "closer relationship would be mutually advantageous" in view of the opportunities in the Dominion for future business inherent in her rapid growth and remarkable resources, but apparently the Canadian character of the company is to be preserved. There will be a freer exchange of scientific, engineering, and manufacturing experience, and this and the U.S. resources and facilities of the G.E. Co. are expected to assist the Canadian Co. to "serve more effectively the interests of the people of the Dominion," a remark which, whatever else it suggests, ought to mean much to British manufacturers if they were more alive to the real electrical trade situation in Canada, with its opportunities for British products in view of the preferential desire that prevails among our Canadian kith and kin.

We select a few other points bearing on the personal side of the enormous world-wide organisation of the Schenectady company. The number of stockholders in the company at December last was 38,570, of whom 43 per cent. were women. The average number of common shares held by stockholders was 53. Under the Charles A. Coffin Foundation, 48 Certificates of Merit were awarded, carrying with them cash honorariums to employés of the company for meritorious work and distinguished service performed during the year. Ten were workmen in the shops; ten were foremen; 16 were engineers; seven were commercial men and women; and five were administrative department employés. Twenty-five thousand of the company's employés owned, or were paying for on the partial payment plan, over $6,000,000 bonds in the G.E. Employés' Securities Corporation (which invests its funds in the shares of the G.E. Co.), and a further issue in January this year was subscribed for by 26,710 employés, who took nearly 5½ million dollars of the bonds.

Out for the Domestic Business.

By L. L. ROBINSON, M.I.E.E., M.Inst.C.E., Borough Electrical Engineer, Hackney.

The importance of the domestic business to supply undertakers has been debated at length during the last two or three years. Those who have gone out for the business seriously are quite satisfied that it is a profitable proposition because of its "off peak" character, even when supplied at very cheap prices which are fully competitive with gas.

That the domestic load is the "bread-and-butter" business of the gas companies is proved by the way in which they have been forced into violent opposition. They have not been clever. Their opposition has been too explosive, and it has caused the public to realise that there is something in this electric cooking after all, or why should the gas companies, who previously held the field in contented idleness, so suddenly wake up and lavish the attention and service upon them which was only conspicuous by its absence hitherto?

In many localities a kind of trench warfare has arisen, but the electrical side has nothing to fear. It has the finished product ready on tap with the dirty and wasteful process of combustion completed before the energy reaches the consumer's premises, whereas gas is merely the crude transport vehicle of energy which leaves the wasteful and filthy process of combustion to be carried on more or less successfully and at best inefficiently in the consumer's apparatus.

I am asked to describe what I consider the best means of attacking the problem of selling electricity for the domestic load.

The first things we are up against are the appalling ignorance of the public in connection with what to us are the commonplace uses of electricity, the natural British conservatism which seems to be ingrained even deeper in the women than the men, and the bogey which we have to some extent created ourselves by charging too much for supplies which have cost us less than we thought they did, and by clever persistent reiteration by the gas companies of the phrase—"electricity is expensive."

Elliott & Fry] [*London.*

Mr. L. L. Robinson, M.I.E.E., M.Inst.C.E.

To obtain the domestic load we must concentrate upon the education of the public—and not only the adult public of to-day—the use of electricity must be taught to the children in the schools.

The "Electricity in Service" exhibit of the Electrical Development Association will sow the seed of desire in the minds of millions of people who visit Wembley this year.

This should be followed next year by numbers of small local exhibitions designed especially with a view to educating women, showing them how much labour and money electricity can save them personally.

Such an exhibition affords an opportunity for the undertaking to offer a number of installations on free trial for three months. This shows confidence and goes well, for all women like to get something free. Out of about 100 such free trials you will get 95 favourable testimonials and five failures. There will be some failures, because the result in each case depends on the cooker and the woman, not on the cooker alone.

With these 95 favourable testimonials you can refute all the nonsense the gas people will have said in the meantime about the failure of electric cooking in national kitchens, &c.

It is a good idea to supply each of your representatives with an album, as shown on page 825, in which a photo of a cooker installation—preferably with the consumer actually using it—is pasted on the opposite page to the consumer's testimonial.

Local newspaper advertising is very important. Let each local paper have a regular revenue from your publicity funds. Don't waste this money; advertising is not an amateur's game, but your amateurish inspirations may be extremely valuable. Send your inspirations to E.D.A. to be worked up into first-class publicity matter.

Don't be afraid of hitting out at your competitors. You may be sure that if they are not hitting you in the face, they are hitting you in the back somewhere. It is bad salesmanship to run down your rival's goods. I don't run down gas. In my area I believe the gas is very good gas, but I should not care to run my house on it, having the alternative of cheap electricity at my disposal. But when your consumers come in and tell you that the gas man has just called and told them that they will be sorry they have given up their gas cookers, which will be kept ready to come back immediately upon request, as lots of electric cookers have been scrapped already, there is no need to be too Christianlike and take this lying down.

The two newspaper advertisements, one by the gas company, and the other the electrical reply, reproduced on page 825, seem to me to be quite justifiable even in the best of communities.

The local Press advertisements should be kept bright and topical. Two appearing on page 826 are very unlike the usual official advertisements of local authorities, but they brought in far more orders than the more usual "proper" sort would have done.

Programmes for local events are good to advertise in. The advertisements should again be topical and designed to rivet the attention of the particular people who are likely to attend the particular function. On the next page two are illustrated; one designed for a concert at a local chapel, the other for a local radio society show.

The issue of the quarterly accounts is a good opportunity to enclose one of E.D.A.'s more serious works, such as "The Home of 1924."

Every envelope can bear a stickyback reminding the consignee of the existence of your service.

Every motor lorry and every jointer's truck should carry a message to the public (see page 826).

Every feeder pillar and sand-bin can carry a hint of

the service which can be rendered by electricity, on an enamelled plaque.

The design of these plaques must be first-rate. They must be conspicuous but unobtrusive, and must not be ugly.

Topical lantern slides at the theatres and kinemas should be used considerably, but the service is rather expensive.

Commerce are very effective and always obtain a good Press in the local newspapers which you are using for advertising.

Often through the Chamber of Commerce you can hear of some little sticky point. Get to work and give a lecture upon it.

An engineer makes a mess of lecturing on domestic subjects. He can better use his skill in making friends with some of his most enthusiastic consumers, who will be delighted to come and give a lecture and demonstration for him if he puts up a good atmosphere in the shape of a little waistcoat-pocket exhibition on the platform. They will talk of their own experience, and talking from experience carries conviction.

The methods described, together with occasional contributed articles to the local papers, really good and rather friendly letters to consumers all actually signed by the manager which preserves a "personal attention" kind of atmosphere, are all that is necessary initially to give the selling of the domestic load a good send-off.

We must constantly be thinking of new methods. There are people who cannot be got to any showroom, so we must go to them. I can foresee the day when each live undertaking with its authorised wireless installation will be giving far more interesting women's hours than are available from 2 LO to-day.

Experience has taught me that one thing more is wanted—a real showroom and demonstration hall, which must be no less than a permanent electrical exhibition. A mere shop is comparatively useless because public interest in it quickly evaporates, and it is difficult to get those who don't immediately want to buy to come in. If you cannot afford more than a shop, it should be kept alive by frequent window displays, such as cooking, sausage-making, sewing, bread-baking, knitting, and a host of other things, the people likely to be interested being circularised the week before each show is to be staged.

Many people seem to have a great difficulty in determining how much they ought to spend on publicity. It is my practice to allocate 1 per cent. of revenue, and,

ELECTRICITY FOR COOKING

AN OUNCE OF FACT IS WORTH A POUND of CLAIM

HOUSEHOLDERS and others who may have had their interest aroused by claims made that Electricity is Cheaper and Better than Gas for Cooking, will be interested in the following statement of PRACTICAL EXPERIENCE issued officially by the National Kitchens Division of the Ministry of Food, in correction of statements favourable to the use of Electricity made in the first edition of their Handbook:

"The Division's experiences of Electricity for Cooking have been anything but favourable. Gas appliances are more constantly reliable and much cheaper to instal and maintain; and they consume less fuel."

Further particulars of "experiences anything but favourable" bought by the National Kitchens Divisions and by others who have been persuaded to experiment with Electricity for Cooking will be readily furnished to Hackney residents, who may be reminded that

IT IS CHEAPER TO BORROW EXPERIENCE THAN TO BUY IT

THE GAS LIGHT & COKE COMPANY
Horseferry Road, S.W.1

Hackney Electricity Dept. agrees with the Gas Co.

To wit: that an ounce of fact is worth a pound of claim

ONE of the Gas Co.'s alleged facts is that Electricity failed in the National Kitchens. But the point is beside the mark for HACKNEY Electricity was never used in the National Kitchen.

NOW—here *is* an ounce of fact. It is bang up-to-date. And it is HACKNEY fact.

An ounce of fact.

Copy of letter addressed to the Hackney Borough Electrical Engineer.

20, AUGUSTUS ROAD,
HACKNEY, E.8
27th May, 1919

I have pleasure in giving you my experience with the ELECTRIC COOKER recently installed here. It was able to be fixed in a convenient position near a good light.

The cleanliness and convenience are apparent at a glance, also it is obvious that food cooked in the fumes of gas cannot be compared to food cooked by Electricity.

I believe that the cost, apart from saving from waste, amounts to little more than half the cost of cooking by gas. I have kept a regular weekly record of the consumption figures, and I have found that the Electric Cooker can be relied on to do its work within a given time which experience will tabulate.

I am quite satisfied and delighted with the use of the Cooker

Yours faithfully,
(Signed) FLORA A. FINN.

KEEP CLEAR OF DIRT, FUMES & POISON. SAVE FOOD BY ORDERING YOUR ELECTRIC COOKER NOW

A postcard to-day to the Borough Electrical Engineer, 306, Mare Street, E.8 mentioning this paper, will bring you all particulars by return. Advice and estimates free. The undertaking belongs to Hackney and is always at your service

Electric Cooking for Summer Comfort

Newspaper Publicity: a Gas Advertisement and the Electrical Reply.

Many other tricks of publicity could be mentioned, but even if these alone are carried out persistently and consistently you will hear the public beginning to talk electricity wherever you go.

Free popular lectures organised and run with the assistance and co-operation of the local Chamber of

Self. [*Clapton.*

The Canvasser's Album.

When the Minister calls

or any other formal caller . . . . .

The almost tragic terror of the housewife at these unexpected visitations entirely disappears when

HACKNEY ELECTRICITY

is used for Lighting, Heating, Cooking and Cleaning in the Home.

Formerly all was dust, dirt, confusion, cold and gloom.

Now, a flick of the finger on a switch and all is brightness, comfort, warmth, and appetising Electrically-cooked morsels, simply radiating a welcome to the visitor.

Why suffer the old-fashioned inconveniences when the advantages of Electricity are offered at less cost than the dirty out-of-date methods?

CALL AT OUR SHOWROOMS

METROPOLITAN BOROUGH OF HACKNEY,
306, MARE STREET, E.8

or

WRITE to the BOROUGH ELECTRICAL ENGINEER for free advice or information.

Advertisement on the Back of a Concert Programme.

HELLO-HELLO--HELLO---HELLO

HELLO

MARE ST., 306 CALLING

HELLO HACKNEY
HELLO HOMERTON
HELLO CLAPTON
HELLO KINGSLAND
HELLO STAMFORD HILL
HELLO DE BEAUVOIR TOWN

Hello All Proud Possessors of Receiving Sets enjoying programmes of music and speech every hour of the afternoon and evening

ELECTRICITY

is the Indispensible Agent in Broadcasting For Your Enjoyment

HACKNEY ELECTRICITY

is Equally Indispensible in Every Home in Hackney FOR

CLEAN LIGHTING
PERFECT COOKERY
HEALTHY HEAT
and
HOME LABOUR SAVING

For Expert Advice, Information, Installations of Cheapest and Approved Sundries, Accessories, &c.,

WRITE :: CALL
PHONE ..... OR
WIRELESS

The Borough Electrical Engineer
HACKNEY ELECTRICITY
306 MARE STREET E.9.
PHONE . . . DALSTON 2481

Advertisement on Programme of a local Radio Society.

so far, I am satisfied that I have obtained good value. This allocation includes the salaries of demonstrators and canvassers, local exhibitions, and contributions to such national displays as the E.D.A. Wembley exhibit.

It is very important before tackling the domestic load to determine upon a suitable tariff. It is a fatal mistake to start with too high a price. It will pay at a small margin above the cost of fuel per unit sold. This may be too much or too little. If the cost of fuel per unit sold exceeds 1d., I should hesitate about tackling cooking and heating at all, but if the cost of fuel per unit sold is ½d. or less, I should still charge 1d. per unit, because 1d. per unit is comfortably competitive with gas. It is much easier to get business if your hire charges are not in excess of the charges made for gas apparatus of equivalent capacity, and if your fuel costs are not in excess of ½d. while you get 1d., you could afford to lend the cookers for nothing, still being well in pocket on the whole transaction, and therefore need not charge more than is charged for equivalent gas apparatus.

If you charge too much, say something in excess of 1½d. per unit, you will revive the "Oh! it's so expensive" talk and hinder the business, even if you reduce your rate afterwards, for a very long time. It is much more difficult to remove a bad impression than it is to create a good one by giving cheap efficient service from the beginning.

There is much in the way a hire proposition is put before the public. They take it best in small units. Therefore, if you are prepared to hire a complete cooking outfit for 7s. 6d. per quarter, translate this into "All this is yours for less than 1d. per day." Include a picture to show what a lot you are giving for this trifling sum.

"MY NEW COOK IS A PERFECT TREASURE, ALWAYS WORKING,—AND NEVER GRUMBLES"
"HOW LUCKY, DEAR! WHAT'S HER NAME"?
"OH! IT ISN'T A 'HER',— IT'S
HACKNEY ELECTRICITY!

Examples of Topical Press Advertising.

It may be useful to discuss some of the difficulties which are met with. These mainly arise from want of familiarity with the slightly different management required by electrical apparatus, and must be dealt with by persistent but polite demonstrators.

The ovens and grills will not give any trouble as soon as people realise that they must be allowed to get hot before cooking commences, and that they can switch off much sooner than they could turn off gas.

Hot plates are slower than gas rings, especially when consumers stubbornly use dirty old convex-bottomed utensils. After education they get used to this, countering it by the use of the quick-boiling kettle, putting vegetables on early and avoiding the use of unnecessary quantities of water. For instance, when boiling an egg, there is no need to drown it—it is just as well cooked in the steam from a very small quantity of water covering the bottom of the saucepan if the lid is kept on. Again, a grilled egg is much nicer than a poached or fried egg, and is cooked in half the time.

Open-type hot plates are quicker on the first boil than the enclosed type, but they are much more liable to damage.

Selfe]

[*Clapton.* *Selfe*] [*Clapton.*

Electrical Publicity in the Streets.

A very annoying trouble arises where the cooker has two open-type hot plates in the hob, and much frying is done on one of them without the other being covered. The splashes from the pan on the working plate

Selfe] [*Clapton.*

Public Interest in the Showroom Window Display.

saturate the dead plate with fat, so that when the dead plate is switched on trouble is likely to ensue.

I prefer to have all the hot plates on the cooker of the enclosed type, and, if there is any complaint of slowness, to supply a separate heavily-loaded open-type "quick-boiling ring" of such a diameter that it will be overlapped by the average saucepan. The enclosed type of plate is ideal for using slow heat, and modern types give very little trouble indeed.

From nearly 400 cooking consumers the average of faults do not exceed seven per week.

You will meet cases where a consumer knows too much to be taught, and will not give the demonstrator a chance. In these the cooker is seldom a success. It is better, then, to accept defeat and take it out, but, fortunately, these cases amount to less than 5 per cent.

We cannot get away from the fact that success depends upon the woman and the cooker, and not upon the cooker alone

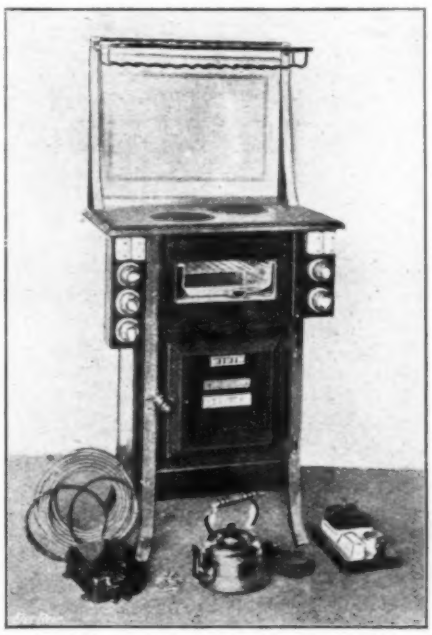
I am afraid that my readers will have come to the conclusion by now that I have gone mad on cooking and that I have forgotten all the other domestic uses.

I assure them I have not, but I disagree in this business with the principle of getting in the thin edge of the wedge by first introducing the toaster, table griller, and all the little gadgets which I am inclined to regard rather like luxurious toys.

The electric cooker is the best friend a housewife ever had in her home; therefore it is best to get it in first and create a good impression. Water heating is another good line. It can be made definitely off peak, but the price per unit wants to be about the order of ½d. if it is to be really competitive.

Radiators seem to sell themselves in very large quantities if the price of the unit does not exceed 1d.

Vacuum cleaners, sewing machines, washing machines, &c., do not use enough electricity to be worth hiring! Nevertheless, where they are properly shown they are becoming popular.



"All This is Yours for less than 1d. per day."

Of course, in a new house nobody thinks of installing gas, and it is a walk-over for electricity, but in old houses where the rival has to be turned out, it is quite a different matter. Even where the consumer owns his own house there is not much difficulty in persuading him to spend the necessary first cost of an installation, because he recognises a good investment owing to the enormous saving he will effect in decorations, &c.

It is the short-agreement property that is most difficult. This absolutely requires some form of "No first-cost wiring scheme." It is not easy to decide what is the best way to get the money back. The simplest and safest, perhaps, is a prepayment meter supply where higher prices are charged per unit than to the ordinary consumer who supplies his own installation. It is surprising how readily people who could not lay down £5 for an installation are quite content to pay 8d. per unit for lighting and 1½d. per unit for cooking, heating, and even water heating.

Two or three years' hire purchase will often secure a contract that could not be obtained for cash.

To keep constantly in touch with consumers and prospects, it is necessary to engage a good staff of demonstrators and outside representatives.

I am afraid that most undertakings want better assistants than they have got for this work. There is a certain amount of enthusiasm which has been shown by the large attendances at some of the E.D.A. Sales Conferences; but alas! how few have given evidence of an intelligent familiarity with their work by speaking at these meetings.

It is very interesting to try an experiment by asking each representative to write an account of the humours and difficulties of his daily task. Some are struck dumb and make no reply. These are evidently not much good. Others write really live stuff, which shows that they understand their business and, what is quite as important, that they enjoy it. The assistant who only works in anticipation of pay-day and in fear of the sack is worth nothing but the latter, while the assistant who enjoys work, and feels it an honour to be able to do some good service in the world, is a treasure and deserves well of his or her employer.

(To be concluded.)

Selfe] [Clapton.

An Exhibit arranged for a Popular Lecture.

Selfe] [Clapton.

The Platform arranged for a Lecture to the Local Chamber of Commerce.

Irons are worth a lot of trouble, they are very popular and produce good revenue, but are so cheap that they can easily be sold outright.

The first cost of installation is still our greatest difficulty in an area where building is fairly complete and where gas is already there.

Overload Protection by "Z" Connected Relays or Trip Coils.

By "W."

AT the present time there is a tendency on the part of municipal electrical engineers to simplify the arrangement of protective gear on straightforward circuits as much as possible, and to reduce the number of relays or direct-acting trips to a minimum, especially when this is accompanied by a reduction in the capital outlay involved. In order to meet this demand it is now the standard practice of a large number of well-known swtchgear manufacturers to put forward triple-pole overload protection using three current transformers, but only two single-pole overload relays (or direct-acting trip coils), utilising for this purpose what is known as the "Z" method of connection. This method of connecting up the relays and current transformers is shown in fig. 1, and may be used on either three-phase three-wire, or three-phase four-wire systems with equal reliability. When it is desired to operate indicating instruments from the current transformers, in addition to the protective gear, the current coils of these instruments should be inserted in the leads at the points marked "x."

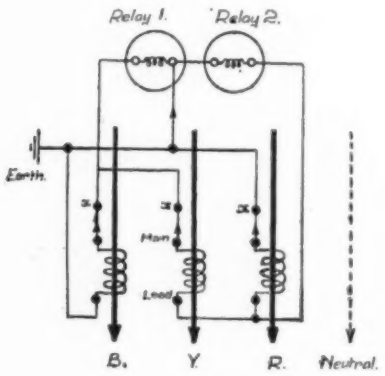


Fig. 1.

Due probably to the fact that the mode of operation of this type of protective gear is not so apparent as that of the commoner method employing three current transformers and three relays, there appears to be a certain amount of prejudice against this arrangement. It is frequently stated, even in responsible quarters, that the protection obtained thereby is haphazard and uncertain. How unfounded these suspicions are will appear from the following examples showing the current flowing through the "Z" connected relays under normal conditions and also under varying conditions of overload. Throughout it has been assumed that the current in the secondary windings of the current transformers with normal full load passing through the primary is 5 amps. An overload of 100 per cent. in the overloaded phase or phases has also been assumed in working out the following examples, but the same conditions would hold for overloads of any other magnitude.

The following symbols are used to denote the various currents:—

I_R. Current in phase red. I_Y. Current in phase yellow.
I_B, Current in phase blue. I_1, Current in relay No. 1.
I_2. Current in relay No. 2.

Assuming the direction of current to be as shown by the arrows in fig. 1, it will be seen from that figure that I_1 is always equal to the vector sum of I_Y and I_B, whereas I_2 is equal to the vector sum of I_R plus I_Y.

Considering first of all the case where normal balanced full-load conditions obtain, I_R, I_Y, and I_B are all equal to 5 amperes. Since they are also at a phase angle of 120 deg. to each other, the vector sum of any two must also be equal to 5 amperes, and consequently we get a current of 5 amperes in each of the relays. This is made clear by reference to fig. 2.

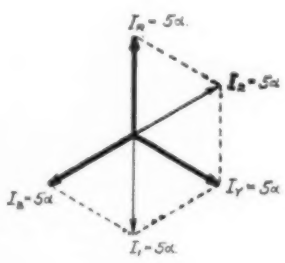


Fig. 2.

Let us now consider a case such as is shown in fig. 3, where there is an overload between the red and blue phases. Here the two currents I_R and I_B each rise to 10 amperes, whilst I_Y remains at 5 amperes. Again, taking the vector sums of I_Y plus I_B and I_R plus I_Y we find that the current in each of the relays is equal to that in the overloaded phases, and consequently both relays will operate with the same precision as if three straight-connected relays had been employed.

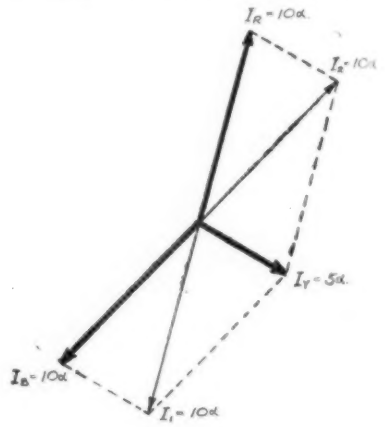


Fig. 3.

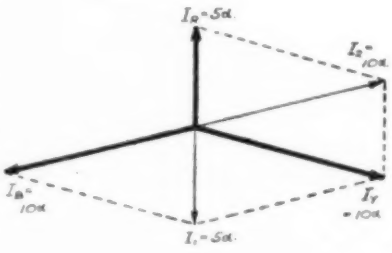


Fig. 4.

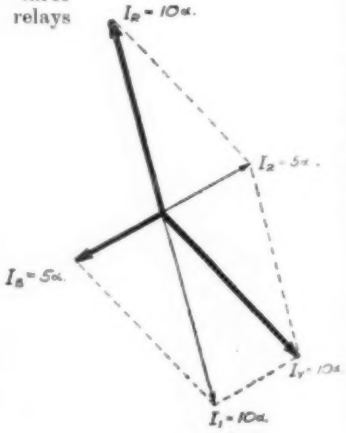


Fig. 5.

Fig 4 again illustrates an overload between phases, the overloaded phases being in this class blue and yellow; I_B and I_Y each become 10 amperes, I_R remaining at its normal value of 5 amperes. Adding these currents vectorially, we find that in this case relay No. 1 is unaffected, the current through it remaining at 5 amperes; I_2, however, rises to the same value as I_B and I_Y, and consequently relay No. 2 will operate. A similar state of affairs obtains with an overload between red and

yellow phases, though in this case it is relay No. 1 which operates. This is shown graphically in fig. 5.

In all the above cases overloads between phases on a three-wire system have been considered, and it is found that in all cases the current passing through one or other of the two relays is equal in magnitude to, though different in phase from, that flowing in the overloaded phases. When, however, we come to faults or overloads between phase and neutral, we find that the current through the relay or relays is not equal to, but is a fixed percentage of, that flowing in the overloaded phase. This point should be clearly kept in mind when deciding on the setting for "Z" connected relays.

With an overload between phase yellow and neutral, the conditions obtained are as set forth in fig. 6. I_Y rises to 10 amperes, whereas I_R and I_B are unaffected. Taking vector sums, we find the current in each relay rises to 8.6 amperes, and both relays will operate.

Figs. 7 and 8 show respectively the conditions obtaining with overloads between phase and neutral on phases blue and red. In each of these cases one relay remains unaffected, but the current in the other rises to 8.6 amperes, and consequently the relay operates.

In conclusion, it may be said that under any conditions of overload, whether between phases or between phase and neutral, at least one of the relays will operate, and that therefore efficient triple-pole overload protection is obtained by the use of two "Z" connected relays.

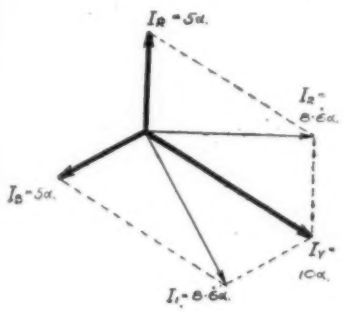


Fig. 6.

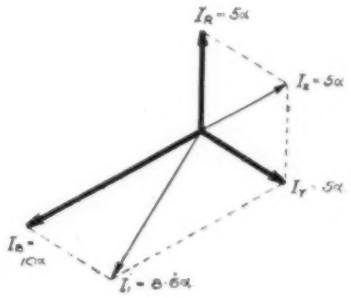


Fig. 7.

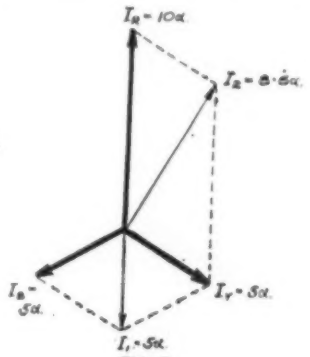


Fig. 8.

The Vogue of the Small Electric Motor.

By "VITAL SPARK."

It is a universally acknowledged fact that in practically every branch of modern industry, the electric drive is a *sine qua non*. In nearly all practical cases it has supplanted the older forms of drive by steam, gas, and oil. Naturally, with an ever-increasing field before it, the design and successful manufacture of small-powered electric motors and their attendant switchgear rapidly improved until the present state of comparative perfection was attained.

In spite of this, however, it is unfortunate that even yet certain anomalies exist in this section of the electrical industry to the detriment of the true spirit of universal brotherhood, neatly epitomised in the pregnant phrase "industrial service." Differences of opinion and mutual misunderstanding between the maker and customer figure largely in this undesirable state of affairs. Neither is the consulting engineer always guiltless. Contributory causes are the appalling ignorance of things technical, and at times one might almost say the crass stupidity, of the intending purchaser, who, probably on the strength of possessing a wireless set or an electric cooker, considers himself quite capable of dictating just what the electrical engineer should supply.

On the other hand, the man wishing to install the electric drive may innocently put himself in the hands of an unscrupulous agent (a *rara avis*, fortunately, but not totally extinct) who, on the principle of never missing an opportunity, may sell him a "pup." To pluck this thorn from the side of this particular branch of the profession requires, so the present writer thinks, a wider dissemination of knowledge concerning the successful application and operation of the small powered electric plant in general industrial service.

It is unnecessary to expatiate on the good service rendered by the B.E.A.M.A. and the B.E.S.A., but experience seems to indicate that a rather more comprehensive scale should be adopted for the benefit of all engaged. The ramifications of the subject are so complex that its full discussion is beyond the scope of the present article, but one or two points in this connection are appended.

In the transaction of purchasing a motor, there exists no definite line of demarcation between the part taken by the buyer and that taken by the seller, except in so far as the former sends his specification and the latter adapts a standard machine, or designs one to fulfil the requirements in the most economical way consistent with satisfactory running. The usual trouble, in the sphere under consideration, is that the specification supplied to the manufacturer is of too scrappy a nature, and various items which seem of little importance in themselves, but which form an appreciable factor in the estimated cost of the machine, are omitted. Naturally, to protect his own interests in the matter, the manufacturer tries to obtain these particulars, a procedure involving delay and much correspondence, bringing in its train problems of late delivery, &c. Often when thus obtained, these details are inaccurate or even misleading. The B.E.S.A. Publication 168-1923 gives very fully the information to be given with an inquiry and when ordering industrial machines, but a few instances will serve to show that more care should be exercised in acquiring this information.

The requisite shaft output, while being sufficient for the job in hand, should not be too liberal, or poor working efficiency and, with induction motors, low power factor, will result. When stating the supply pressure, frequency, and phases, a point sometimes omitted is the company's regulations. A series of motors were supplied to a firm, complete with standard starters, but on delivery it was discovered that the local authorities stipulated slow-motion starting gear for the particular horse power employed.

Concise descriptions of the starting characteristics and operating cycle are essential to the designer of both motor and switchgear. In connection with certain sawmill machinery, an induction motor newly supplied refused to start up; then it was found that the light load had been greatly under-estimated. Of course, mutual disparagements followed between the customer and the maker. When stating the nature of the load, the kind of drive to be adopted should be expressly given. A back-geared motor, with pinion and spur wheel suitably designed and properly aligned, was put in; unfortunately the slight noise produced by the gear was intolerable, and a silent chain drive had to be adopted.

The actual conditions of service and the location of the driving unit are important in considering the question of enclosure and rating. Several costly mistakes have been made in this connection. A group of machines dispatched to an oversea customer were returned soon after their installation and, on their arrival home, were hardly recognisable, all the expanded metal covers being choked up with fluff. Semi-enclosed motors had been specified, but "someone had blundered." In another case when a drip-proof machine was called for, the surroundings showed that a splash-proof enclosure was essential. An engineer supplied with a pipe-ventilated motor, after rigging it up (that's one way of putting it), maintained that it exceeded the specified temperature rise. The maker's tests had been perfectly satisfactory, and later on it transpired that the area of the suction pipe was only a fraction of the pipe-ventilated opening, resulting in the throttling of the air supply. Another motor suffering from the same malady was investigated; it was housed in a small brick lean-to with imperfect ventilation. Roof mounting also involves factors which are sometimes forgotten. Such a machine with remote control gave satisfaction until it was discovered that the regulator was overheating due to impeded ventilation caused by blocked screen openings.

Innumerable similar cases could be cited due to the varied conditions existing in all departments of human activity, but sufficient has been said to indicate that to raise the status of our profession, it is necessary to strive for a clearer appreciation of the various factors affecting the economical installation and maintenance of the most useful invention of the electrical pioneers. As in every other walk of life, closer co-operation between the manufacturer or his agent and the customer will be a decisive step in the direction of the desired end.

Exports and Imports of Electrical Goods and Machinery in April, 1924.

THE exports during the month of April showed an increase of £233,572, as compared with the previous month, principally due to an expansion in telegraph and telephone cable and material exports of £174,000. Whilst enhanced values are also recorded in electrical machinery (£27,000), unenumerated electrical goods and apparatus (£31,000), and in the items for glow lamps and meters, a falling off is shown in the exports of insulated wires and cables, arc lamps, and batteries and accumulators. It is satisfactory to observe that the month's total is £289,000 higher than in April, 1923. The import section showed a slight falling off as compared with March, decreases being noted in electrical machinery and electrical goods and apparatus (unenumerated), whilst increases are recorded in insulated wires and cables, glow lamps, batteries, meters, and carbons. As compared with April last year the imports for the month under review are nearly £13,000 lower. The re-export total was £10,000 higher than in the previous month, the chief increase being in the total of re-exported electrical machinery.

	Exports.			Imports.			Re-Exports.		
	Electrical exports for Apl., 1924.	Inc. or dec. as compared with Mar., 1924.	Inc. or dec. as compared with Apl., 1923.	Electrical imports for Apl., 1924.	Inc. or dec. as compared with Mar., 1924.	Inc. or dec. as compared with Apl., 1923.	Electrical re-exports for Apl., 1924.	Inc. or dec. as compared with Mar., 1924.	Inc. or dec. as compared with Apl., 1923.
Electrical goods and apparatus (unenumerated)	£169,720	+ £31,858	+ £49,314	£66,931	− £6,561	− £19,824	£3,516	− £238	+ £689
Insulated wires and cables ...	188,092	− 12,022	+ 37,600	30,532	+ 1,933	+ 8,339	366	+ 310	− 172
Glow lamps	28,320	+ 9,222	− 1,415	11,613	+ 2,753	+ 2,374	54	− 592	− 493
Arc lamps and parts	329	− 1,475	− 296	375	− 413	− 54	—	− 9	− 49
Batteries and accumulators ...	50,968	— 5,079	+ 13,298	20,093	+ 1,761	+ 9,188	27	− 5	− 1,327
Meters and instruments ...	40,726	+ 9,133	+ 11,141	17,689	+ 3,928	+ 9,604	88	− 765	− 160
Carbons	2,868	− 390	+ 1,712	12,044	+ 2,370	+ 6,291	1,055	+ 920	+ 482
Electrical Machinery—									
Electrical machinery (unenumerated)	187,430	+ 52,266	+ 65,737	92,152	− 6,872	− 15,640	11,587	+ 8,039	+ 3,103
Railway and tramway motors	27,199	− 35,489	+ 8,193	—	—	—	—	—	—
Other motors and generators ...	205,904	+ 14,340	+ 34,904	—	—	—	—	—	—
Switchboards (not telegraph or telephone)	5,173	− 3,516	− 13,331	7	− 37	− 1,800	909	+ 833	+ 909
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cable (not submarine)	119,925	+ 70,938	+ 19,319	11,941	+ 455	+ 1,359	394	+ 394	+ 394
Submarine telegraph and telephone cable	48,574	+ 32,129	+ 11,446	—	—	—	—	—	—
Telegraph and telephone instruments and apparatus ...	236,890	+ 71,595	+ 61,712	55,104	+ 432	− 12,711	3,022	+ 1,222	+ 1,056
Totals	£1,312,113	+ £233,572	+ £289,334	£318,481	− £224	− £12,874	£21,018	+ £10,109	+ £4,431
Increase or decrease for the four months ended April, 1924 ...		Exports. + £794,672			Imports. + £136,237			Re-exports. + 12,974	

The Illumination of Sea Fronts.—A popular method of making pleasure beaches attractive at night is to produce decorative effects by means of electric lights. The success of this method of decoration, however, has in the past depended upon the ability of the colouring of the lamps to withstand the effects of heat, sea spray, and inclement weather. In order to prove the suitability of "Osram" colour-sprayed lamps for this purpose the borough electrical engineer of Hastings recently subjected some samples of these to very severe tests. The lamps were first dipped in cold sea water and afterwards boiled in the same medium. Later they were kept burning in the open for three hours on three nights a week during the inclement weather experienced during eight weeks from January to March. The lamps came out with flying colours (the term is strictly figurative), and they are now in use in large quantities on the Hastings sea front.

Legal.

Re-Echo Electrical Manufacturing Co., Ltd.

THE petition of the British Broadcasting Co., Ltd., for an order for the compulsory liquidation of this company came before the Winding-up Court on May 13th.

MR. SIMS (for the petitioners) said they were judgment creditors for £904. The respondent company had passed a resolution for a voluntary winding-up. The grounds of opposition to the petition were that debentures had been issued. The Receiver appointed for the debenture-holders was the same gentleman who was appointed liquidator. Counsel said this was a bad case because the company had not paid the petitioners a penny for wireless sets supplied, and in June and December last year debentures were issued to directors.

MR. CHRISTIE (for the respondent company) read evidence that the debentures were issued for cash supplied to carry on business.

MR. SIMS said the petition was not opposed by any of the creditors, and those supporting it were creditors for some £1,200, including Marconi's Wireless Telegraph Co., Ltd., and the Mullard Radio Valve Co., Ltd. He described the voluntary liquidation as a hole-and-corner affair.

MR. CHRISTIE (for the respondent company) said that there had been a dispute between the Postmaster-General and the B.B. Co., which he was instructed had had an unfortunate effect on the trade, as a result of which the Re-Echo Company had been brought down. The company was hopelessly insolvent and a compulsory order would do no good.

His LORDSHIP made a compulsory order.

Action Against Oldham Corporation.

AN action brought by Joel Foster against the Oldham Corporation to recover damages in respect of interference with the light enjoyed by his property in Churchill Street East, Oldham, entered upon the third and concluding day of the trial in the Chancery Court, Manchester, on May 14th. The claim arose through the Corporation raising the height of the power station opposite houses owned by the plaintiff. This deprived them of a certain amount of light. The plaintiff alleged that it was so serious as to reduce the value of his property by £550. The Corporation called evidence that the ordinary use of the houses was not affected, and that therefore the plaintiff could not succeed in his claim. The Vice-Chancellor reserved judgment.

Mine Officials Prosecuted.

IN the Dunfermline Sheriff Court, on May 13th, Andrew Crowe and James McLean were prosecuted for a breach of the Regulations under the Coal Mines Act. The case arose out of an accident to a workman in Foulford Pit, Cowdenbeath, where respondents were manager and under-manager respectively, the workman having received an electric shock from a trailing cable. Against both officials it was alleged that they neglected to prevent the damaged or defective cable from being further used underground until it had been sent to the surface, and there properly repaired, and neglected to have the cable forthwith replaced by a spare cable in good and substantial repair. It was further charged against the manager that he had neglected to instruct the under-manager to have the replacement carried out, with the result that a workman came into contact with the conveyor motor casing, which had become "alive," through contact with the defective cable, and died from electric shock.

Both officials pleaded "Not guilty" to the charge.

A machineman, who was with the deceased man at the time of the occurrence, said he had been sitting against the conveyor pans for about six or seven minutes before he felt a shock. He shouted to his neighbours to switch off the current. Deceased went to switch off the current, but was caught and killed.

Mr. J. A. B. Horsley, H.M. Electrical Inspector, Mines Department, and Mr. William Lowdon Whitehaven, H.M. Inspector of Mines, gave evidence for the prosecution. The latter stated that as soon as the accident to the first workman became known the under-manager ought to have seen that the cable was sent up to the surface to be examined and repaired. The fact that the man had got a serious shock was sufficient to justify his doing so. Mr. Horsley expressed the view that after the accident to the first workman those in charge might have made a preliminary test of the repaired places on the cable to see whether there was any moisture there, in which case a weakness would probably have been found.

In his evidence the manager stated that the under-manager, who had examined the cable, reported that there was nothing wrong with the cable with the exception that he had found a loose piece of patching tape, which he had replaced. At the same time, he said, he did not agree with the under-manager when he said there was nothing wrong with the cable, and he gave instructions to an electrician, who might have misunderstood him, to the effect that the cable was to be taken out of the pit at once and properly tested at the surface.

The under-manager, in his evidence, explained that immediately after the first accident he examined the cable and found no damage or defect. He admitted having seen two inches of tape loose at the end tied to the cable, and he stated that he put on a piece of new black adhesive tape for the purpose of stamping down the loose part and to prevent more of the tape coming off.

Sheriff UMPHERSTON found it proved that the cable was defective. It might, however, have been a different part from that which was defective in the morning, and if the Procurator-Fiscal would delete that part of the charge relating to the consequent death of the conveyor pan shifter, he would find the charge proved. The charge was accordingly amended, and in each case a penalty of £5 was imposed.

Metropolitan-Vickers Electrical Co., Ltd., v. British Thomson-Houston Co., Ltd.

IN the Chancery Division on May 16th, Sir Duncan Kerly, K.C., applied to Mr. Justice P. O. Lawrence to fix a date for the hearing of this case, which had appeared as the last case in his Lordship's warned list. Sir Duncan asked that July 8th should be fixed for the hearing. The other side concurred in the application.

MR. TREVOR WATSON, for the British Thomson-Houston Co., said that the case was likely to last at any rate four days.

MR. JUSTICE LAWRENCE fixed July 8th for the trial.

Newton Abbot Electricity Undertaking.

A KING'S Bench Divisional Court, on May 14th, heard arguments in connection with rules obtained by the Torquay Corporation calling upon the Minister of Labour and Sir Wm. MacKenzie to show cause why they should not be prohibited from holding an arbitration in connection with the transfer to the Corporation of the private electricity undertaking at Newton Abbot.

Appearing for the Minister of Labour, the SOLICITOR-GENERAL (Sir H. H. Slesser, K.C.) explained that the real point was a claim by Mr. G. E. Smith, the late manager of the Newton Abbott electric light undertaking, for compensation on account of the fact that by the purchase by the Corporation of Torquay of the undertaking he was dispossessed of his employment. An arbitration was ordered by the Minister of Labour, and Sir Wm. MacKenzie was appointed, but the Corporation had obtained rules for *certiorari* and prohibition to have that arbitration set aside. Mr. Smith claimed no less than £4,000. The Solicitor-General explained that by an Act of Parliament the Newton Abbot Urban District Council could purchase at a stipulated time and at a certain price the private electricity undertaking. By an arrangement the Torquay Corporation obtained powers to raise the money, and, with the Newton Abbot Council to buy the undertaking, and the question for the Court was whether the officers of the undertaking were transferred with the concern or whether they were entitled to an arbitration to decide the amount of compensation they should receive for being thrown out of employment. The Minister regarded it as his duty to appoint an arbitrator, having regard to the provisions of the Electricity Supply Act, but the Torquay Corporation contended that the Minister had no jurisdiction to do that because the transfer was outside the Act.

The LORD CHIEF JUSTICE said it was clear that the transfer of the undertaking was not under the Act of 1919, and it was therefore for the Electricity Commissioners to decide whether it took place in consequence of the Act before an arbitration took place.

The SOLICITOR-GENERAL thought the Commissioners only came in after the arbitrator had made his award.

Mr. CRAIG HENDERSON, K.C. (who appeared for Mr. G. E. Smith) supported the arguments of the Attorney-General that the appointment of the arbitrator was in order and a proper procedure. He explained that the Torquay generating station had become inadequate, and the Commissioners pressed the Corporation to look around for another station to meet the demands. That was why they purchased the Newton Abbot concern. There was no reasonable alternative way out of the difficulty that had arisen between the officers of the concern and the Corporation except the appointment of an arbitrator. Counsel then read an affidavit by Mr. Smith, who now was the engineer and manager of the Dartmouth electricity concern, and alleged that the Torquay Corporation had not given the Court all the information that it could give. He contended that the whole thing took place under the Act, and that arbitration should proceed.

Mr. COMPSTON, K.C. (for the Corporation), read an affidavit from the Town Clerk of Torquay, and addressed the Court at considerable length on the question whether once an arbitrator had been appointed he could be prohibited from holding his inquiry.

Delivering judgment, the LORD CHIEF JUSTICE said the case gave a strong illustration of the difficulty in construing some Acts of Parliament. In his opinion nothing had been done here, either by the Labour Minister or Sir Wm. MacKenzie, that could be considered to be outside the jurisdiction given them by the Act. In the circumstances the rules would be discharged. Justices Shearman and Roche agreed.

F

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Pulverised Coal Firing.

I am not commercially interested in either pulverised fuel plant or mechanical stokers, but there is so much in the article on "Pulverised Coal Firing *v.* Mechanical Stokers" by W. D. Wylde in your issue of May 2nd which invites criticism, or requires qualification, that I should like to point out one or two facts.

Mr. Wylde comes to the remarkable conclusion that "any superiority of pulverised coal firing over mechanical stoking is directly due to the use of forced draught. . . ." Surely the *undoubted* superiority—from the combustion point of view at any rate—is due directly to the fact that the coal is very finely powdered and therefore exposes the maximum surface to the oxygen with which it is to combine. This results in rapid and practically perfect combustion which can be controlled almost as easily as that of oil or gaseous fuels. In the case of mechanical stoking the coal passes slowly through various stages before combustion is complete—if that adjective may be used; in fact, in addition to unburnt carbon being left in the ashes, if the smoke issuing from the chimneys of many modern power stations is any criterion, the volatile matter is also often incompletely burnt.

Mr. Wylde states that most of the ash from a pulverised fuel plant is deposited in the surrounding district. The fact is that the ash is so finely divided that none of it has ever been found after passing up the chimney. On the other hand, the grits deposited round some power stations using mechanical stokers contain unburnt carbon and pollute the air and constitute a nuisance which cannot be "ignored, wilfully or otherwise." I could name a power station where the grits collected at one of the chimney bases amount sometimes to about 1 per cent. of the coal fired under the boiler concerned, so that the amount which is discharged into the atmosphere may be imagined.

Mr. Wylde implies that induced draught is not susceptible of close control. I should be happy to explain to him a system whose outstanding feature is flexibility of control.

If Mr. Wylde is not kind to pulverised fuel, neither is he flattering to mechanical stoking. However, it is impossible, in a letter, to deal adequately with all the points Mr. Wylde raises and I will rest content with having ventilated those mentioned above.

R. H. Allen.

London, *May 19th*, 1924.

Diesel-Electric Ship Propulsion.

With reference to the article in your issue of the 9th inst. on "Electrically Propelled Passenger Liners," by Mr. Regnauld, in which he quotes largely from a paper read by myself before the Institute of Marine Engineers on March 8th under the heading of "A 20,000-Ton Diesel-Electric Liner," it is, in my opinion, not quite appropriate to use such nomenclature as "Electrically Propelled ————," "Electric Ship Propulsion," &c., as it claims too much for electricity. The electrical apparatus serves a secondary purpose, *viz.*, speed reduction, similar to the function of the mechanical gears and, in the case of the Föttinger system, the hydraulic turbines. In the latter cases we would hardly speak of "Gear-wheel ship propulsion" or "Hydraulic ship propulsion." True electric ship propulsion would be in that example where electric power is supplied from sources external to the ship; as—if it could be possible—by the reception of wireless power waves or by contact with an overhead wire.

Mr. Regnauld has inadvertently given the impression that I arrived at the relative dividends for the two types under discussion on the basis of an oil consumption of 1.05 lb. per s.h.p.-hour for a steamship, as compared to 0.504 lb. for a motorship; in order to minimise any thought that a certain amount of bias may have been given to the motorship in these figures, I would point out that the oil consumptions should read 1.01 lb. and 0.504 lb. respectively, or including 0.04 lb. in each case as an additional domestic load, the figures become 1.05 lb. and 0.544 lb. respectively.

P. J. Higgs.

Teddington, *May 12th*, 1924.

[We recognise the importance of precision, and appreciate our correspondent's contention; but if it were accepted, and adopted, would not many other questions at once arise? For instance, an "electrically driven workshop" is well understood to be one in which the machines are driven by electric motors; but on the lines laid down by Mr. Higgs, the machines would not be electrically driven unless electric power was obtained, not from the factory's own generating plant, but from an outside source—and even then, the machines would really be driven by the plant which converted the energy of coal, oil, or falling water into the form of electricity, no matter where it was situated. We suggest that, provided that misconception cannot occur, conventional expressions such as that to which Mr. Higgs takes exception are convenient and useful, and convey a perfectly correct impression to the reader's mind.

Incidentally, electricity serves the function of power transmission as well as speed reduction, and may indeed be more valuable in the former capacity than in the latter.—EDS. ELEC. REV.]

The Single-phase Induction Motor and the Starting Problem.

Mr. Pensabene-Perez, writing in your issue of the 16th inst., apparently adopts the standpoint that I do not believe in the commutator motor solution of the above problem. I feel sure that those with a sense of humour who read my letter published in your issue of the 2nd inst., will be convinced that I am all in favour of the particular type of apparatus to which we refer. Fortunately for them, neither Mr. Pensabene-Perez, nor his staff, even in their junior days, held the exalted position of shift charge engineer or switchboard attendant in an a.c. generating station with street arcs in series. Had they had that unpleasant experience, they would have had little difficulty in placing the "Dramatis Personæ" to whom I referred. It is true that the E.D.C. Co. has written to me concerning this 3-h.p. motor claim, but I submit that a power factor indicator on the site is a simpler and more convincing piece of educational evidence than written claims. If Mr. Pensabene-Perez will add a little salt to my previous letter perhaps he will appreciate that I have a motive entirely in his interests, which I believe is already working in the desired direction, but others will have to be convinced, before matters mature, as I hope they will.

W. E. Rogers,, A.M.I.E.E.

London, *May 18th*, 1924.

The A.C. Commutator Motor and the Engineer's Education.

My attention has been drawn to a letter by Mr. N. Pensabene-Perez, in which he queries the work which technical colleges are doing on the subject of a.c. commutator motors.

Mr. N. Pensabene-Perez may be interested to know that students at Battersea Polytechnic receive lectures on this subject, and also our laboratory equipment includes several types of single-phase commutator motors, on which the students conduct tests as part of their course.

We are also giving a special course of evening lectures during the summer months on a.c. commutator motors, the lectures being followed by laboratory work on them.

I think, in view of the above statements, that Mr. Pensabene-Perez may rest assured that technical teachers are fully alive to the importance of this subject.

H. C. Mann, B.Sc. (Eng.), A.M.I.E.E.

Battersea Polytechnic, *May 17th*, 1924.

Science and Labour Conference.—A conference on "Science and Labour," to be held at the British Empire Exhibition on Friday, May 30th, and Saturday, May 31st, has been organised by the British Science Guild and the National Joint Council of the Trade Union Congress and Labour Party. The president is Lord Askwith, K.C.B., K.C., and the chairman Mr. A. A. Purcell, M.P. Applications for tickets of admission to the Conference should be addressed to the conference secretary at 15, Gower Street, W.C.1. Tickets may also be obtained from the secretary, British Science Guild, 6, John Street, W.C.2, or the secretary, National Joint Council, 33, Eccleston Square, S.W.1. The Prime Minister will open the Conference. "The Place of Science in Government" will be discussed in the morning of the first day, the opener being Mr. Sidney Webb, M.P., President of the Board of Trade, and the chief speakers Sir Richard Glazebrook and Major A. G. Church. In the afternoon the subject will be "Scientific Research in Relation to Industry," and the opener Mr. Hugo Hirst; other speakers will be Sir Oliver Lodge, Sir Daniel Hall, and Mr. A. P. M. Fleming.

The "Co-operation of Science and Labour in Production" will be discussed at an evening meeting, the opener being Lord Ashfield, and the chief speakers Sir Hugh Bell and Mr. W. Straker.

On Saturday, May 31st, at 11 a.m., a discussion on "Science and the Human Factor" will be opened by Sir Arthur Newsholme, and the chief speakers will be Dr. C. S. Myers, Dr. Cyril Burt, and Miss May Smith. In the afternoon "Science in Educational Organisation" will be the subject, the opener being Mr. R. H. Tawney, and the chief speakers Sir Thomas Holland and Dr. R. P. Scott.

Tele-photography.—By a new process of transmitting by electricity the American Telephone & Telegraph Co. has successfully sent from Cleveland (Ohio) to New York 15 photographs in two hours. The pictures, which were five by seven inches in size, were all perfect enough for reproduction in the morning newspapers.—*Reuter* (New York).

Business Notes.

Bankruptcy Proceedings.—WILLIE MACE, 40, Causeway, Watchet, Somersetshire, engineer.—The public examination of this debtor was held recently at Taunton. The statement of affairs showed gross liabilities of £817, of which £513 was expected to rank, against assets of £57. It appeared that on March, 14th, 1923, debtor started business as an electrical engineer, his idea being to build up a business for his sons. He traded as Mace Bros., and said that he had a total capital of about £480. He believed that at that time he owed about £160, so that he was about £320 to the good when he started business. His deficiency account, which was dated March, 1923, showed a deficiency then existing of £151, and the Official Receiver pointed out that it would have to be amended. Debtor stated that the district was an extensive one, and he and his sons could not get round it with a bicycle, and consequently he borrowed money in order to purchase a car for £175. He had since disposed of it to one of his creditors. He had not kept any books of account before he commenced business, and since he had been trading, he had kept two small cash books, which were a fairly correct record of his receipts, but he had no record of his expenditure. He intended to start a set of books, but the business did not improve. The cash books showed takings of about £450, and the gross profits of about 25 per cent. did not cover working expenses. He became aware of his position about three months before he filed his petition. Certain articles of furniture were claimed by members of his family, and the Official Receiver said he wished for an adjournment until he had received those claims and the deficiency account had been amended. The examination was adjourned.

CYRIL KENNETH WALLIS, 51, Mons Avenue, formerly Bedford Street and then Longford Road, Bognor, Sussex, electrical engineer.—The public examination of this debtor was held on May 7th, at the Court House, Brighton. The statement of affairs showed liabilities of £308, and there was a deficiency of £277. Debtor attributed his failure to want of capital and depression in trade. It appeared that he commenced business on his own account, after being employed as a journeyman, in 1921, with £150 borrowed capital. He discontinued trading in 1923. The examination was closed.

CHARLES JAMES TOMLIN, 27, Parkview Gardens, Hendon, and 12-13, Henrietta Street, Covent Garden, W.C., electrical engineer.—Under a receiving order, made on a creditor's petition, the first meeting of creditors herein was held on May 15th, before Mr. D. Williams, official receiver. The debtor has lodged accounts showing liabilities £983, chiefly in respect of borrowed money, and assets £22 10s., the value he puts upon a claim for £450 in respect of director's fees due to him from Tye Tyres, Ltd., lately carrying on business at Peckham. He held £100 shares in the company, but places no value upon them, the company having gone into voluntary liquidation. In February, 1923, Tomlin, Booker, Ltd., electrical engineers, was registered, with offices at 12-13, Henrietta Street, Covent Garden, and the debtor was appointed director at a fee of £500 per annum. At present the company is doing business, but without profit, and the debtor has only drawn £11 on account of salary during the present year. He attributes his failure to the collapse of Tye Tyres, Ltd., and to his rent and rates being out of proportion to his income. In the absence of any proposal, the case was left with the Official Receiver to be wound up in bankruptcy.

L. KELSALL and H. KELSALL (KELSALL BROS.), electrical engineers, Castle Place, Maison View Road, Dover.—First meeting, May 20th, at Carey Street, W.C.; public examination, June 14th, at the Guildhall, Canterbury.

D. E. JONES (D. EMRYS JONES & Co.), electrical contractor, 29, Carne Street, Pentre.—First meeting, May 22nd; public examination, June 13th, both at the County Court House, Pontypridd.

L. L. JAMES (W. G. JAMES & SON), electrical engineer, 62, Canterbury Street, Gillingham, and 137, High Street, Rochester, Kent.—First meeting, May 23rd, at the Official Receiver's office, 280a, High Street, Rochester; public examination, June 2nd, at the Court House, Eastgate, Rochester.

J. E. ELLIOTT and J. M. ELLIOTT (J. E. ELLIOTT & Co.), electrical engineers, 12, Broad Street, Oxford.—Bankrupts' discharge suspended for two years until April 16th, 1926.

F. B. THORPE, electrical engineer, 1a, West Laithgate, Doncaster.—Last day for proofs for dividend, May 23rd. Trustee, Mr. W. Emmerson, 99, Albion Street, Leeds.

C. F. M. METCALF, electrical and wireless engineer, 8 and 10, Cowgreen, Halifax.—First and final dividend of 1½d. in the £, payable May 27th, at 1, Albion Street, Leeds.

H. P. TUCKER, electrician, Empire Bungalow, Ellacombe, Torquay.—Trustee, Mr. S. V. Upham, 23, Fleet Street, Torquay, appointed May 13th.

W. CALDWELL (Caldwell & Son), electrical engineer, 26, Victoria Road, Hale, Chester.—Trustee, Mr. J. Grant, Official Receiver, Byrom Street, Manchester, released May 6th.

J. B. ROBERTSON, electrical engineer's manager, Dahiem, Whitbarrow Lane, Lymm, Chester.—Trustee, Mr. E. D. Symond, 11, Dale Street, Liverpool, released May 2nd.

Company Liquidations.—STRODE & Co., LTD.—Winding up voluntarily. Meeting of creditors May 23rd, at the Institution of Chartered Accountants, Moorgate Place, E.C.—Particulars of claims to the Liquidator, Mr. W. G. Jefferys, 66, Coleman Street, E.C., by June 20th.

RADIO SUPPLIES, LTD.—Winding up voluntarily. Liquidator, Mr. W. W. Smiles, Norwich House, Southampton Street, W.C.1. Meeting of creditors May 23rd, at the Holborn Restaurant, High Holborn, W.C.

NEWINGTON ELECTRICAL CO., LTD.—Particulars of claims by June 15th to Mr. D. Bell, 14, Dale Street, Liverpool (one of the liquidators).

PREMIER ACCUMULATOR CO., LTD.—A meeting of members is called for June 16th, at 2a, Sheep Street, Northampton, to hear an account of the winding up from the Liquidator, Mr. A. L. Airs.

GRASSINGTON ELECTRIC SUPPLY CO., LTD.—A meeting of members is called for June 17th, at the Wilson Arms, Grassington, Skipton, to hear an account of the winding up from the Liquidator, Mr. G. J. Harker.

INTERNATIONAL RAILOPHONES, LTD.—A meeting of members is called for June 21st, at the offices of Messrs. Meredith, Turner & Co., Provincial Buildings, Corporation Street, Birmingham, to hear an account of the winding up from the Liquidator, Mr. W. Seymour Turner.

RE-ECHO ELECTRICAL MANUFACTURING CO., LTD.—Winding-up order made by the High Court on May 13th.

KEIGHLEY GAS & OIL ENGINE CO., LTD.—The *Financial Times* states that at a meeting of creditors held at Bradford, on the 16th inst., it was stated that the share capital was increased to £100,000 in 1920. Since 1921 the company has continually lost money, and on February 2nd last found that the whole of its capital had been lost. The liabilities estimated to rank for dividend are put at £140,248, and the deficiency is estimated at £100,693. The sum of £23,385 was lost by depreciation of foreign currency, and the nineteen weeks' moulders' strike and the thirteen weeks' lock-out by the Engineering Employers' Federation weakened the financial position of the company. The meeting appointed an advisory committee to act in the voluntary liquidation.

NORTHUMBRIA ENGINEERING AGENCIES, LTD., 86, Pilgrim Street, Newcastle-upon-Tyne.—Proofs for first and final dividend have to be lodged by June 7th, with the liquidator, Mr. C. Woollett, 4, Northumberland Street, Newcastle-upon-Tyne. Liabilities, £2,390; assets available for dividend, £457.

ANDCOLE & TURNER, LTD.—On Tuesday, Mr. Justice Romer, in the Companies Winding-up Court, made an order for the compulsory liquidation of this company on the petition of the Midland Electrical Manufacturing Co., Ltd., Birmingham, judgment creditors. Petitioners' counsel said the company did not appear, and there was no opposition to the petition, which was supported by a number of creditors, including the General Electric Co., Ltd.

Dissolutions of Partnership.—BIRKETT & SHAW, wireless and electrical engineers, 22 & 24, Wheeler Gate, Nottingham.—Mr. A. C. R. Birkett and Mr. E. F. Shaw have dissolved partnership. Debts will be attended to by Mr. Birkett, who will continue the business in his own name and at the same address.

WOODCOCK & HANNAH, plumbers and electrical contractors, 442, Cheetham Hill Road, Cheetham Hill, Manchester.—Mr. T. P. Hannah and Mr. S. N. Woodcock have dissolved partnership. Mr. Woodcock will attend to debts and continue the business.

Trade Announcements.—MR. E. H. BELLAMY, late of Bellamy, Pritchard & Co., has commenced business as an electrical engineer at 134, Upper High Street, Lye, Stourbridge.

Mr. C. RATCLIFFE has opened additional premises at 34, Trinity Street, Boar Lane, Leeds, where he desires to receive catalogues, &c., regarding wireless apparatus, &c.

THE WANDSWORTH ELECTRICAL MFG. CO., LTD., has moved its London offices and stores from 165, Wardour Street to "Primrose House," 26 & 27, D'Arblay Street, Wardour Street, Oxford Street, W.1.

AUTOMATIC & ELECTRIC FURNACES, LTD., is carrying out a demonstration of its Wild-Barfield electromagnetic furnaces during the current week at the showrooms of the City of Birmingham Electric Supply Department, 21, Paradise Street, Birmingham.

Catalogues and Lists.—MR. H. C. SLINGSBY, 89, 95, and 97, Kingsway, W.C.2.—List No. 242, illustrating and describing the "Slingsby-Jacklift" industrial truck.

VICKERS-SPEARING BOILER CO., LTD., 20, Kingsway, W.C.2.—An illustrated booklet describing "Illinois" chain-grate stokers and the "Illinois" flat suspended arch.

THE BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, W.C.2.—An illustrated price list of many types of "Mazda" lamps—vacuum, gasfilled, neon, &c. Also a small poster in colours advertising the company's electric fans.

MESSRS. E. G. APPLEBY & CO., LTD., 70, Victoria Street, S.W.1.—A mailing card advertising the "Phœnix" lifting magnet.

THE EDISON SWAN ELECTRIC CO., LTD., 123-5, Queen Victoria Street, E.C.4.—Three catalogues dealing, respectively, with accumulators and house-lighting sets; a.c. motors; and instruments, meters, and switchgear. Illustrated and priced.

FULLER'S UNITED ELECTRIC WORKS, LTD., Woodland Works, Chadwell Heath, Essex.—List No. 160, dealing with standard sealed-in accumulators for house lighting and general purposes; and List No. 2,500, illustrating and describing plate- and block-type batteries in celluloid and ebonite cases.

THE WANDSWORTH ELECTRICAL MANUFACTURING CO., LTD., Ludgate Hill, Birmingham.—An illustrated price list of quick-make-and-break tumbler switches, switch plugs, boxes for flush switches, &c.

MESSRS. GALSWORTHY, LTD., 16, Newman Street, Oxford Street, W.1.—An 80-page catalogue containing illustrations of all types of lighting fittings, together with a price list of these.

MESSRS. A. W. KNIGHT, LTD., 167, Rye Lane, Peckham, S.E.15.—An illustrated and priced pamphlet describing the "Kaynite" radio coil-winding machine.

MESSRS. HERBERT MORRIS, LTD., Loughborough.—An illustrated catalogue of pulley blocks, hoists, jacks, winches, elevating trucks, &c. Fully priced. Also a leaflet dealing with the Morris vertical cross-tube boiler.

MESSRS. MATHER & PLATT, LTD., Park Works, Manchester.—Publication No. E.143, giving a well-illustrated description of the company's self-synchronising rotary converter.

THE UNDERFEED STOKER CO., LTD., Aldwych House, Aldwych, W.C.2.—An illustrated brochure describing the "Lopulco" system of pulverised fuel firing for boilers.

THE RUNBAKEN MAGNETO CO., LTD., Derby Street, Manchester.—An illustrated and priced booklet giving details of automobile electrical accessories of all kinds—starting, ignition, lighting, &c.

METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester.—Descriptive Leaflet No. 405/2-1, dealing in a general way with automatic substations and their equipment. Fully illustrated.

Cricket Match.—At Cardiff, on May 17th, a General Electric Co. team played a cricket match against eleven men selected from the staffs of the following electrical firms:—The British Thomson-Houston Co., Ltd., the English Electric Co., Ltd., the Electrical Apparatus Co., Ltd., Messrs. Besley, Bailey and Co., Ltd., the Liverpool Cable Co., Ltd., Messrs. Hayman and Co., Messrs. Cooper & King, Ltd., and Messrs. McWhirter and Sons, Ltd. Mr. W. H. Stone, of the last firm, captained the team, which beat the General Electric Co., Ltd., by 30 runs, scoring 45 against their opponents' 15.

Book Notices.—"A Guide to London" (158 pp.). London: Odhams Press, Ltd., for the "Underground" companies. Price 1s. net.—There are a number of unique features in this guide (the third of a series) which make it good value for the low price charged. Issued as an adjunct to the 'bus and "Underground" systems, it yet manages to steer clear of pure advertisement. Of particular interest are the long pictures of the principal London thoroughfares, giving details of practically every building. This part alone should alleviate the impatience engendered by the present slow rate of progress in those streets. The outskirts of London are also dealt with in an interesting manner.

"*Journal* of the Institution of Electrical Engineers." Vol. lxii. No. 329. May, 1924. London: E. & F. N. Spon, Ltd. Price 10s. 6d.—This issue contains the following papers: "Pulverised Fuel and Efficient Steam Generation," by Mr. D. Brownlie; and "A Vector Treatment of Long Transmission Lines," by Mr. S. Holmes.

"The *Electrician* Annual Tables of Electricity Undertakings." (151 pp.). London: Benn Bros., Ltd. Price 10s. nett, postage 6d.—There is no change in the "make-up" of the thirty-seventh edition of these useful tables. They have been brought up to date, and the preface states that particulars of upwards of 100 undertakings have been added to the Colonial and Foreign Sections.

"Continuous Current Circuits and Machinery," by J. H. Morecroft and F. W. Hehre. Vol. I. Pp. viii+467; figs. 377. London: Chapman & Hall, Ltd. Price 20s. net.

"*Journal* of the American Institute of Electrical Engineers." Vol. xliii. No. 5. May, 1924. New York: The Institute. Price $1.

"The Story of the Lamp" is the title of a handsome booklet prepared by the General Electric Co., Ltd., of which copies were presented to the Press representatives at the recent inspection of the G.E.C. pavilion at the British Empire Exhibition. Ably written and admirably illustrated, it tells the story of the invention and subsequent history of the incandescent electric lamp, the manufacture of which was taken up by the associated company, Robertson Electric Lamps, Ltd., in 1893. The carbon lamp was the subject of a similar publication in its time, but in this volume its story occupies but a few pages, the bulk of the space being devoted to the tungsten vacuum and gasfilled lamps. The Nernst, osmium, and tantalum lamps, which to many of our readers will be but names, are mentioned in passing, but they were the subjects of the keenest interest until the intractable metal tungsten was broken into service. "Broken" is literally apt, for in the early days the breakages of the fragile filaments nearly broke the hearts of the makers. However, Mr. Hugo Hirst had faith in the future of tungsten, and took the risk of manufacturing the new lamps in enormous quantities; when the art of drawing tungsten wire was learnt, the difficulties were ended, and in this book the whole process of making the wire, the bulb and the complete lamps in the G.E.C. factories is described in detail. The manufacture of Osglim lamps and wireless valves, welfare work, and the G.E.C. research laboratories, are also briefly described.

Recent Contracts.—The London County Council has extended its contract with the SIEMENS & ENGLISH ELECTRIC Co., LTD., for the supply of the whole of the incandescent lamps required by the Council for a further twelve months.

MESSRS. JAMES GORDON & CO., LTD., inform us that, after exhaustive trials, one of the largest steam power stations in London has placed an order for a further eight "Duplex-Mono" recorders.

Electricians' Wages.—As a consequence of the proposed reference of their claim for a general increase of 10s. per week to arbitration, the members of the Electrical Trades Union and other unions concerned are balloting on the question of a strike or arbitration. The ballot is not expected to be completed in less than a fortnight, and the result is to be communicated to the Joint Industrial Council for the Electricity Supply Industry, which will hold a special meeting for the purpose of considering it.

Local Exhibition.—HACKNEY.—During the last fortnight a very interesting exhibition has been arranged and demonstrated in the windows of the showrooms of the Electricity Department, coffee being ground by a self-contained motor and grinder, grinders being fitted not only for ordinary granulation but for pulverising. During the day, also, demonstrations have been given with electrically-operated, self-contained meat mincers and sausage makers, and crowds have congregated round the windows. The coffee grinders and meat mincers are of Messrs. Herbert & Sons, Ltd.'s "Lion" make.

Brush Technical Publications.—We have received from the Brush Electrical Engineering Co., Ltd., Loughborough, a series of new descriptive publications dealing with the company's leading products. No. 1,001 gives an illustrated account of the Brush-Ljungström turbo-generators, of which the company has built over 250,000 kW since 1913, this type of machine having gained a wide vogue and proved thoroughly reliable. No. 1,002 gives details of notable economies of fuel resulting from the installation of 5,000-kW Brush-Ljungström sets in British power stations, and No. 1,003 relates to the special Brush condenser which supports the turbo-alternator (dispensing with foundations for the latter), and the Brush-Delas steam-jet air-extraction apparatus. Transformers are described in detail in No. 2,001, including the new internal tapping switch of which an account was given in our last issue, and No. 6,000 deals with alternators for steam-engine and water-wheel drive; No. 7,000 describes frequency-changer sets, and No. 8,000 liquid starters. All these brochures are admirably produced and fully illustrated, and include drawings and dimensions, but are not priced; they contain a great deal of useful information, and, each being confined to a particular subject, they are very handy for reference.

British Empire Exhibition Notes.—THE RELAY AUTOMATIC TELEPHONE CO., LTD., is distributing a souvenir booklet, bearing the title, "The Nerves of the Exhibition," containing a number of details relative to the "Relay" system at Wembley.

MESSRS. F. W. BERK & CO., LTD., have also issued a small brochure dealing with the industries of the principal British towns.

MESSRS. COLE, MARCHENT & MORLEY, LTD., are distributing in connection with the Exhibition a collection of illustrated leaflets describing a number of their manufactures—"Uniflow" steam engines, steam extraction engines, Diesel engines, condensing plant, refrigerating plant, air filter-coolers, oil filters, &c.

A poster (E.D.A. 421), bearing coloured views of the E.D.A. display and other parts of the Exhibition, has been issued by the British Electrical Development Association. This emphasises the fact that the display is the exhibit of local electricity suppliers and contractors, and therefore appeals to local "patriotism."

The millionth visitor to the British Empire Exhibition at Wembley arrived early on Saturday afternoon, May 17th. The total of visitors up to Friday night, May 16th, was 954,200. Over 400 organised parties—of anything from 200 to 1,500 people—were among the visitors.

Annual Dinner.—The joint staff of the various works and offices under the control of Callender's Cable & Construction Co., Ltd., held their annual dinner on Friday last at the Holborn Restaurant, with Sir Tom Callender in the chair, supported by the chairman of the company, Sir Fortescue Flannery, Bart., Sir Malcolm Fraser, Bart., G.B.E., and Sir Ernest Moir, Bart. About 260 were present. In proposing the toast of "Success to the Company," Mr. Howard Foulds, the secretary, drew attention to the large number of the staff who had been in the service of the company for more than 20 years, and attributed this to the treatment which the staff received at the hands of the managing director, Sir Tom Callender, and to the friendly interest taken by him in the staff. Sir Fortescue Flannery, in replying, developed this point, and referred to what he called the "Callender spirit" which permeated the company from top to bottom, and was one of the reasons for the excellent results of the company's operations. The Chairman's health was proposed by Mr. A. Crooke, the accountant of the Anchor Works. Sir Tom, in reply, reminded his hearers that he was the oldest servant of the company, and

be hoped to continue in its service for many years yet, a sentiment which was heartily applauded by all present. An excellent programme was provided, and the arrangements reflect considerable credit on the joint honorary secretaries, Mr. H. Vince and Mr. A. Morgan.

Copper and Lead Prices.—Messrs. F. Smith & Co. report May 20th:—Copper (electrolytic) bars, £67 15s., 25s. decrease; do. do. sheets, no change; do. do. wire rods, £77 15s., 25s. decrease; do. do. b.c. wire, 10d., ¼d. decrease.

Messrs. James & Shakespeare report May 20th:—Copper bars (best selected), sheet and rod, £94; £2 decrease; English pig lead, £30 10s., 5s. decrease.

Messrs. W. F. Dennis & Co. report May 20th:—Magnet steel, 8d. per lb., 2d. decrease.

Battery Prices.—FULLER'S UNITED ELECTRIC WORKS, LTD., announces the adjustment of the prices of its stationary house lighting batteries in accordance with the present state of the lead market, the recent 10 per cent. increase being thus removed.

Engineering Employers and the Unions.—The conference between employers in the engineering industry and representatives of the trade unions was held in London on May 15th. Sir Allan Smith presided, and, according to the *Daily Herald*, addressed the meeting with regard to the state of the engineering industry, dealing with foreign competition, the alteration in costs of production, and the general difficulties. He made no definite statement of the purpose of the employers. Mr. Brownlie replied on behalf of the Amalgamated Engineering Union. He asked if the employers were prepared to stabilise and equalise the men's wages in the same way as profits, and appealed for security against unemployment, under-employment, and low wages. He declared that the employés were not getting their share in the prosperity of the industry. The union asked for time to consider the questions raised by the employers, and the conference was accordingly adjourned until May 22nd.

An official report of the Conference issued a day or two later showed that Sir Allan Smith gave a summary of returns received from firms federated to the Engineering and the National Employers' Federations. These showed that the balance on working during 1923 was only 2.73 per cent., while for 1924 it was not expected to be more than 0.3 per cent. Out of this capital charges, income tax, and other charges had to be paid, and money provided for work in progress.

Lighting and Power Notes.

Aylesbury.—LOAN.—The Town Council has applied to the Electricity Commissioners for sanction to the borrowing of £5,079 for the supply of electricity to Waddesdon Manor, by means of overhead cables.

Ayrshire Electricity Board.—The first meeting of the Ayrshire Electricity Board was recently held at the Electricity Works, Kilmarnock. Ex-Provost Smith, Ayr, was appointed chairman, and Mr. Bexon, Kilmarnock, engineer and general manager. Sir Alex. Kennedy, the original architect and engineer of the undertaking, was re-elected to that position. Mr. James E. Shaw, solicitor, Ayr, was appointed solicitor to the Board. It was agreed that meetings be held monthly.

Bangor.—YEAR'S WORKING.—During the year ended March 31st last the net surplus of the Corporation electricity undertaking was £1,147.

Barrow-in-Furness.—PROPOSED HYDRO-ELECTRIC SCHEME.—The Corporation is making investigations into the possibilities of a hydro-electric scheme on the River Duddon before undertaking a scheme at Backbarrow.

Bradford.—NEW SUB-STATION.—The Electricity Committee proposes to purchase a site at Allerton Road and Bullroyd Road for the erection of a sub-station.

Bridge of Allan.—MR. J. E. MACEWAN, A.M.I.E.E., Glasgow, has been appointed advising engineer for the promotion of the Bridge of Allan Town Council's Electricity Order.

Burton-on-Trent.—ELECTRICITY EXTENSIONS.—Further important works for the extension of its area of electricity supply have been projected by the Corporation. It is proposed, subject to the sanction of the Electricity Commissioners being obtained, to extend the mains to Gresley, Foremark, and Fauld, at a total estimated cost of about £17,000.

Canada.—BRITISH COLUMBIA.—Tenders are being called for the construction of the tunnel to connect Alouette and Stave lakes which the British Columbia Electric Co. has projected in order to increase its power supply. The tunnel will be 3,400 ft. in length and 15 ft. in diameter. The power house at the Stave lake end of the tunnel will develop 11,500 h.p., and it is expected that the plant will be completed and in operation by the end of 1925.—*Reuter's Trade Service* (Vancouver, B.C.).

China.—YALU HYDRO-ELECTRIC SCHEME.—It is announced that a company is to be formed for the purpose of carrying out the scheme for harnessing the Yalu river to provide an electricity supply. At first distribution will be to Autung and New Wiju, and the power will be used to operate a tramway to be constructed between Mukden and Hsingking.—*Eastern Engineering.*

Carlisle.—LOANS SANCTIONED.—The Town Council has received the sanction of the Electricity Commissioners to loans of £50,000 for extensions to the electricity works, £15,000 for mains, and £120,000 for plant.

Continental.—BELGIUM.—A new 5,000-kW turbo-alternator has recently been installed at the power station at Slykens of the Société de Chemin de Fer Electrique d'Ostende-Blankenberghe et Extensions, bringing the capacity of the plant up to 13,500 kW.

DENMARK.—The director of one of the Danish electricity works which are co-operating in distributing electric current on the mainland of Denmark states that a new submarine cable of twice the capacity of the present one will be laid across the Sound between Sweden and Denmark.—*Swedish Export.*

Crewe.—LOAN.—The Town Council has applied to the Electricity Commissioners for sanction to a loan of £7,500 for mains.

Foleshill.—ELECTRICITY SUPPLY.—The local Council having approached the Coventry Corporation for a supply of electricity, the latter body has offered to extend the mains to the district if a revenue of £1,500 per annum is guaranteed.

Hawarden.—ELECTRICITY SUPPLY.—The North Wales Power Co. has proposed certain alterations and modifications to the proposed transmission of electrical energy in the district, involving the moving of a sub-station. The Hawarden Council has decided to withhold sanction of the proposed alteration until further information has been obtained. The Council has decided to urge its consulting engineer, Mr. Freeman, to proceed with the plans of distribution mains as soon as possible.

Irish Free State.—ENNISCORTHY (Co. WEXFORD).—A Local Government inquiry is to be held into the proposed electric lighting scheme. Following considerable opposition to a former scheme, an inquiry was held in 1915. The decision was in favour of the Urban Council, and a Bill embodying the scheme was passed in the British House of Commons. A proviso, however, was made preventing the Council from proceeding with the work until after the war. In 1922 the matter was again taken up, and recently the Council decided to apply for a loan of £11,500 to carry out the scheme.

WATERFORD.—At a recent meeting of the Corporation, Messrs. MacEntee and O'Kelly, consulting engineers, submitted a report on the proposed electricity scheme for the district. It is recommended that the scheme be carried out in three stages, and that semi-Diesel engines be installed. The estimated capital cost of the scheme is £20,925, and the charges would be 9d., 5d., and 4d. for private lighting, public lighting, and power, respectively. The report is to be considered at a special meeting of the Corporation to be held at an early date.

Llandhaiadr.—INAUGURATION OF ELECTRICITY SUPPLY.—The hydro-electric scheme for the district was formally inaugurated on May 5th. The system of supply is a.c., 3-phase, 400 V and 250 V.

Lowestoft.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking for the year ended March 31st last show a total revenue of £44,144, as compared with £42,214 in the previous year. Working expenses amounted to £28,830, as against £26,999, leaving a gross profit of £15,134 (£15,215). After deducting capital charges there was a net profit of £3,913.

Morocco.—Several electricity supply undertakings organised under French and Belgian auspices are approaching completion in Morocco, among them being those of the Société d'Electricité de Mazagran, the Société d'Electricité de Saffi, and La Société d'Electricité de Marrakech.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

BARNSLEY.—Lighting: From 6d. to 5½d. per kWh. Kinemas and theatres, from 4.5d. to 4.1d. per kWh. Domestic rate: From 1½d. to 1d. per kWh.

LOWESTOFT.—Lighting: A reduction of 1d. per kWh. Large power consumers: A reduction of ½d. per kWh. Shop-window lighting after closing hours: 6d. per kWh.

BRAUNTON.—*Braunton Electric Light & Power Co., Ltd.*—Lighting and power: A reduction of 1d. per kWh. Public lighting: A reduction of 2s. 6d. per lamp.

WAKEFIELD.—Electricity supplied through prepayment meters from 7½d. to 7d. per kWh.

Special Order.—The Electricity Commissioners have submitted to the Ministry of Transport for confirmation an Order made by them authorising the Electrical Distribution of Yorkshire, Ltd., to supply electricity in the urban districts of Conisborough, Darfield, Hemsworth, Knottingley, Royston, and Tuckhill, the rural districts of Doncaster, Kiveton Park, Pontefract, and Thorne, and parts of the rural districts of Barnsley, Rotherham, and Wartley.

Swindon.—NEW PLANT.—The Town Council has decided to install a 1,000-kW turbo-generator at the electricity works, at an estimated cost, including foundations, pipe work, switchgear, &c., of £10,000, and application is to be made to the Electricity Commissioners for sanction to the borrowing of this sum for the purpose stated.

Seaford.—ELECTRICITY SUPPLY.—The Urban District Council on May 12th received a report from Mr. Hawtayne respecting an electricity supply for the town. He estimated the cost of the Council's own scheme at £37,450, and that of a bulk supply at £33,930. The General Purposes Committee reported that it was not prepared to recommend that the scheme, if adopted, should be carried out by the Council. The matter was discussed in committee.

Sheffield.—PROPOSED ADVISORY BOARD.—The City Council has received a proposal from the Electricity Commissioners that an advisory board be established for the North-East Midlands District. A special committee appointed by the Council to deal with the question of electricity supply has considered the suggestion with the Rotherham Corporation, and has recommended that the Commissioners' proposal be adopted, and that the Town Clerk be instructed to prepare the draft Order for the formation of an advisory board, and that it be submitted to the Commissioners for their approval.

Stirlingshire.—STREET LIGHTING.—The Eastern District Committee of the county has under consideration an offer by the Scottish Midlands Electric Supply, Ltd., for public street lighting by electricity. The price quoted is £2 5s. per lamp, and as the cost of the scheme to the company is £20,000, a long-term contract is desired.

Walsall.—ELECTRICITY EXTENSIONS.—The Electricity Committee has recommended to the Town Council that the mains be extended at an estimated cost of £5,126.

United States.—HYDRO-ELECTRIC DEVELOPMENT.—According to the *Electrical World*, the United States Geological Survey has recently brought up to date its record of the water-power development in the United States. The new figures show that there are now about 3,200 water-power plants of 100 h.p. or more, having a total installed capacity of 9,086,958 h.p., an increase of about 1,160,000 over the total for 1921. The following are the principal States in which progress has been made: New York, 1,542,983 h.p.; California, 1,451,830 h.p.; Washington, 480,356 h.p.; Maine, 473,188 h.p.; and North Carolina, 431,500 h.p.

Wellington (Somerset).—ELECTRICITY SUPPLY.—The Urban District Council has given consent to an application by Messrs. Crompton & Co., Ltd., for powers to supply electricity within the district.

Whitchurch (Hants.).—OPPOSITION TO SCHEME.—The Rural District Council has decided to lodge an objection to the electric lighting scheme of the Whitchurch & District Gas Co., Ltd.

Tramway and Railway Notes.

Australia.—MELBOURNE STRIKE.—Mr. Justice Powers, of the Arbitration Court, in his decision regarding the tramway strike, ordered that the Melbourne tramway strikers should apply for re-employment on the old terms by the 19th inst. at the latest, and that the insubordinate motorman should simultaneously apply for reinstatement, but the Tramways Board might, if it chose, prescribe a penalty in his case. There is a maximum penalty of £1,000, and the liability for a union to be struck off the register in the event of refusal to carry out an order of the Arbitration Court. The men decided to resume work as ordered.

Birmingham.—TRACK RENEWALS.—With a view to providing work for the unemployed, the City Council has decided to relay the tramway track between Pebble Mill Road and Dawlish Road, at an estimated cost of £34,410.

Bradford.—LOANS SANCTIONED.—The Corporation has received the sanction of the Ministry of Transport to the borrowing of the following sums for tramway track reconstruction: Nelson Street, £11,717; Otley Road, £30,645; Wakefield Road, £11,032; Queensbury, £38,661; Thornton Road, £19,947.

Brazil.—RAILWAY ELECTRIFICATION.—Approval has been given by the President to plans for the electrification of the line of the Paulista Railway between Campinas and Tatu. This is an extension of the lines already electrified by an American company from Sao Paulo to Campinas.

Continental.—SPAIN.—The Government has authorised the electrification of railway between Vittoria and Estella. The new Trans-Pyrenean railway, which is to be electrified, is nearing completion, and it is hoped that it will be opened during the current year.

Edinburgh.—NEW ROUTE.—The tramway extensions proposed under the Corporation Provisional Order have been passed, and submitted to the Ministry of Transport for approval. The proposed George Street tramway will be linked up with the existing system at Shandwick Place and proceed *via* Hope Street and George Street to the east end. A new line will be constructed in Melville Drive, connecting with Clerk Street, and thus provide a through route from Tollcross to the South Side. The Slateford route will be extended from the present terminus to the village of Slateford, and the Slateford terminus will be linked up with the Laughton terminus. The present Craiglockhart line will be extended to Colinton village *via* Colinton Road, a distance of 1¼ miles, and the new route proposed in Salamander Street will link up the system at Bernard Street with Seafield.

Japan.—RAILWAY ELECTRIFICATION.—Further extensions of the electrification programme of the Government railways are to be put in hand. The electric service between Tokio and Yokohama is to be extended to Odawara and Yokosuka. The Tokaido line from Tokio, through Yokohama, Nagoya, Kyoto and Osaka, to Kobé, a length of 375 miles, is also being electrified. The section of railway between Murakami and Nenjyugaseki, about 25 miles in length, is expected to be completed in July, making a circuit in the Ou district railway system and providing a through service between Niigata and Aomori by way of the Japan sea coast. The new railway will enable passengers from Kobé to Aomori to save a distance of 156 miles. Aomori will hereafter be reached from Kobé by way of Maibara, Kanazawa, Toyama and Niigata. The so-called "back line" along the Japan sea coast will be completed to connect Shimonoseki with Aomori.—*Eastern Engineering.*

Lowestoft.—YEAR'S WORKING.—The report on the working of the tramway undertaking for the year ended March 31st last shows a total revenue of £21,730, as compared with £22,024 in the previous year. Working expenses amounted to £16,493 (£18,311), leaving a gross profit of £5,236 (£3,713). Sinking fund charges absorbed £5,224, and there was a net profit of £12, as against a deficit of £2,157 in 1922-23. This is the first year in which the undertaking has shown a profit. The number of passengers carried amounted to 3,487,106.

Plymouth.—YEAR'S WORKING.—The accounts of the Corporation tramway undertaking for the year ended March 31st last show a net profit of £10,712.

Russia.—ELECTRIC TRACTION.—A report has been presented to the technical section of the Transport Planning Commission with regard to the electrification of the systems of transport. So far as concerns the measures to be taken to ascertain the demand for railway electrification, the report states that the extent of the work in the immediate future will be governed by the financial position of the country, in connection with which it has to be borne in mind that conversion necessitates a large initial expenditure, the redemption of which depends directly upon the amount of the traffic. In the meantime the traffic, excepting individual cases, at the present time is far from reaching the limits which would justify the change over to electric traction. Under these circumstances, the report expresses the opinion that the conversion of the railways in general to electric traction should be deferred to the distant future, and the work confined to individual lines dependent upon special local conditions, as, for example, the Suram summit, the suburban traffic of Moscow, &c.

Southend.—STRIKE.—Because of the alleged victimisation of a conductor, who is reported to have been suspended for a week for the non-collection of excess fares, the tramway men struck work on the afternoon of May 17th, but resumed work later.

Walthamstow.—LOAN.—The Urban District Council has applied to the Ministry of Transport for sanction to the borrowing of £78,360 for doubling the tramway track.

Wigan.—PROPOSED RAILLESS CARS.—At a recent meeting of the Town Council, the Tramways Committee recommended that a railless car service be introduced on the Martland Mill Bridge route in place of the existing tramcars, at an estimated cost of £10,805. After discussion the matter was referred back for further consideration.

Telegraph and Telephone Notes.

Australia.—TELEPHONE PROGRESS.—During 1923 the net increase in telephone subscribers amounted to 28,516, and by the end of the present year it is anticipated that that figure will have grown to 40,000.

France.—RADIO TELEGRAPHISTS' STRIKE.—A section of the telegraphists employed by the French radio company known as Radio France went on strike on May 7th. The men demand an increase of wages from 550 francs, their present minimum pay, to 600 francs per month. The strike concerns only a portion of the staff, and it has so far in no way caused any interruption of traffic.

New Zealand.—RADIO NEWS SERVICE.—New Zealand radio news, the first service of the kind in the Southern Pacific, was transmitted on May 5th to inter-colonial and trans-Pacific passengers in ships of the Government and amalgamated lines. Its extension to Raratonga and the Chatham Islands is being considered.—*Reuter* (Wellington).

South Africa.—CAPE TOWN RADIO STATION.—The construction of the station is well in hand—four masts are now being erected, and are well advanced. In all there will be 16 masts 800 ft. high, and 32 masts of 300 ft. The staff employed at the present time numbers about 500, and the equipment of the station is expected to cost about £500,000. The station will cover an area of about 4½ miles square.

Spain.—EXPLOITATION OF THE TELEPHONE SYSTEM.—A financial group, which includes the Banco Urquiqo and the Banco Hispano-Americano, in agreement with American manufacturers, is founding a company for the exploitation of the telephone system in the whole of Spain. The new concern will ask for a concession of the lines belonging to the State. The material employed and the management will be American, while the capital will be found in Spain.—*Reuter's Trade Service* (Madrid).

The Telephone Service.—ILLEGAL USE.—Charges of illegally consuming electricity belonging to the Postmaster-General and obstructing the business of the Post Office were made at East Ham on May 15th against Louis Thomas May. It was stated to be the first case of the kind. May had annoyed operators at the exchange by making frivolous calls and using bad language from a public call-box. May said he had no excuse to make, and was fined £2 for obstructing Post Office business and £1 for using the electricity.—*Daily Mail.*

United States.—NEW ALASKA CABLE.—The United States destroyers *Hull* and *Corry*, equipped with sonic depth-finders, have been ordered to Alaskan waters to survey the ocean bed and select the route for the proposed new United States Government cable between Seattle (Washington) and Seward (Alaska). Congress has appropriated for 1,000 miles of new cable in the Alaskan system, and it is now being manufactured in Great Britain. The cable ship *Dellwood* is already *en route* with the first section, which will probably be laid early in June; the second section is expected to be completed and laid by September.—*Financial Times.*

Radio Notes.

Aerial Regulations.—PORTSMOUTH.—The Corporation has forbidden the extension of wireless aerials across public highways.

BOURNEMOUTH.—The Town Council, on May 6th, resolved to forbid the use of aerials and loud speakers on the beach.

Australia.—REGULATIONS CONFERENCE.—The Postmaster-General called a conference in Sydney last month of representatives of Australia, New Zealand, and Fiji, to consider proposed amendments to the existing radio regulations. The conference has agreed to allow "open" receiving sets to be used (as against sets capable of receiving one wave length only), and also to the issue of a common licence for all owners of receiving sets at 40s. per annum for the broadcasting subscription, exclusive of 5s. per annum for the Government. During the discussion it was stated that in March there were 2,864 experimental licences in New South Wales.

Continental Broadcasting.—NEW STATIONS.—Broadcasting is rapidly increasing all over Europe, and a number of new stations are now opened or are in course of erection upon the Continent. Several of these will use considerable power. The Spanish station (School of Posts and Telegraphs, Madrid) now transmits fairly regularly on Sundays from 6 p.m. until 8 p.m. This concert is broadcast upon a wave-length of 480 metres. Several short-wave German stations can now be heard between 390 and 500 metres, and in addition to the transmitting stations at Berlin, Frankfort, and Munich already in operation, new stations at Königsberg, Breslau, Hamburg, Stuttgart, and Leipzig will be operating local services by the end of this month. Each new station will have a range of about 100 miles. Copenhagen is to have a 1-kW broadcasting station. This is in addition to Lyngby (Denmark), which regularly transmits a one-hour concert on Sundays on a wave-length of 2,400 metres.—*Daily Mail.*

Jamaica.—RADIO REGULATIONS.—According to *Commerce Reports* there is practically an absolute prohibition at present against the erection and operation of radio equipment in Jamaica. The local government, however, is endeavouring to draw up a set of rules under which permits may be granted for the operation of receiving sets by private individuals.

South Africa.—BROADCASTING LICENCES.—Applications have been received by the Postmaster-General for licences to establish broadcasting services at the following places: Durban Corporation, within a 200-mile radius of Durban. Graaf's Trust, Cape Town, within an area bounded by a line joining Knysna—Prieska—Upington (The Cape) thence to the south-eastern extremity of the south-west territory. Associated Scientific and Technical Societies of South Africa, within a radius of 100 miles of Johannesburg; this station was expected to commence operations on April 1st. It has a power of 500 watts, and the apparatus is American.—*Commerce Reports.*

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the ELECTRICAL REVIEW *in which the "Official Notice" appeared in our advertisement pages.)*

Open.

Australia.—MELBOURNE.—June 24th. Postmaster-General's Department. Telegraph equipment.*

June 30th. City Council. 100 single light units, complete with Goliath or Mogul sockets, for ornamental street lighting; 185 ditto, with standard Edison screw sockets; ten 2-light units, with standard Edison screw sockets.*

August 4th. State Electricity Commission. 66,000-V transformers. (See this issue.)

NEWCASTLE (NEW SOUTH WALES).—June 12th. City Council. H.p. submarine cables and accessories.*

SYDNEY.—July 14th. Municipal Council. Voltage regulators.*

Batley.—Electric lighting installation, Bradford Road West Store. Mr. J. T. Wilman, secretary, Batley Co-operative Society, Ltd., Batley.

Belgium.—ANTWERP.—June 26th. Direction de l'Outillage du Port. 15 electrically-operated portal cranes, each of three metric tons capacity.*

May 28th. Belgian State Railway authorities (Office de l'Electricité, 25, Rue de la Charité, Brussels). 15,000 metres of specially insulated wire.

Belgian Congo.—May 27th. The Compagnie des Chemins de Fer du Congo Supérieur aux Grands Lacs Africains, 7, Rue des Cultes, Brussels. Material for the establishment of telephone line in the Belgian Congo.

Bristol.—June 9th. Docks Committee. Three 2-ton movable electric jib cranes. Mr. T. A. Peace, Chief Engineer's Office, Avonmouth Docks.

Burton-on-Trent.—May 27th. Board of Guardians. Electric lighting installation, administrative block, vagrants' block, laundry, &c., Institution and Children's Home. Mr. H. S. Askew, clerk.

Coatbridge.—Electrical wiring, &c., in connection with the new special school. Mr. John Stewart, master of works, 20, Albert Street, Motherwell.

Derby.—Electrcity Department. Two water-tube boilers, complete with economisers, draught plant, stokers, or alternatively for powdered fuel plant. (See this issue.)

Eccles.—May 26th. Electricity Department. Twelve months' supply of single-phase a.c. meters. (May 16th.)

Edinburgh.—May 26th. Saughtonhall Housing Association. Electrical work for 24 houses. Specifications, &c., from R. & A. K. Smith, 44, Queen Street, Edinburgh.

June 9th. Electricity Supply Committee. 33,000-V overhead main transmission line. (See this issue.)

Enniscorthy.—June 10th. Urban District Council. Generating sets, switchgear, storage battery, overhead mains, oil storage tank, and overhead travelling crane. (May 9th.)

Forfar.—May 30th. Electric Lighting installation at County Infectious Hospital, Whitehills, Forfar. Specifications from Dr. Sinclair, County Buildings, Forfar.

Glasgow.—May 26th. Corporation. Works in connection with the alterations and addition to Kelvinside substation. Electrical engineer.

Hamilton.—May 26th. Town Council. Electric lighting installation at the new Town Hall. Town Clerk.

Irish Free State.—DUBLIN.—June 25th. Postmaster-General's Department. 50 tons h.d. copper wire; 7 tons bronze wire; 3,600 stay rods; and 25,000 spindles. (May 16th.)

May 26th. Dublin United Tramways Co. (1896), Ltd. Six months' supplies, including electric lamps, electrical fittings, &c. (May 16th.)

May 27th. Great Northern Railway (Ireland). Six months' supply of stores, including electrical fittings, lamps, cable, wire, &c. (May 16th.)

NEWCASTLE WEST (CO. LIMERICK).—May 31st. Newcastle West Electric Light & Power Co., Ltd. Supply of (1) Crude oil engine and d.c. generator, (2) Generator panel. Specification, &c., from Messrs. J. P. Tierney & Co., consulting engineers, 44, Kildare Street, Dublin.

Jamaica.—August 1st. Colonial Secretary. Licence for the establishment of a telephone system in Kingston and St. Andrew, Jamaica. (May 9th.)

Kilmarnock.—Corporation. Electric lighting installation in connection with the 30 houses being erected for the Corporation. Mr. Thomas C. Stewart, surveyor, 61, Portland Street, Kilmarnock.

Kirkcaldy.—May 26th. Electricity Works. Cables and roadwork. (May 9th.)

Knaresborough.—Urban District Council. Static substation equipment, h. and l.p. cable networks, transformer kiosks and transformers, service cables, &c. (May 9th.)

London.—INDIA STORE DEPARTMENT.—May 27th. Telegraph insulators (porcelain, screwed-pattern), and telephone repeater equipment. (May 9th.)

LONDON COUNTY COUNCIL.—The Highways Committee is inviting tenders for two electrically-driven tank wagons for flushing purposes, and an electric motor for the stone-crusher plant at Poplar depôt.

Manchester.—May 28th. Electricity Committee. Twelve months' supply of cables, potential and current transformers, electricity meters, and time switches. (May 9th.)

New Zealand.—WELLINGTON.—July 15th. Public Works Department. Twelve sub-station transformers for Waikato.*
TAIHAPE.—August 1st. Borough Council. Turbo-generator set, pressure governor, automatic weir for the Taihape hydro-electric station. (See this issue.)

Plymouth.—June 12th. Electricity Department. C.i. pipes. (See this issue.)

Roxburgh.—June 9th. Education Authority. Re-wiring the electric lighting installation at Hawick High School. Mr. W. A. Edward, executive officer, Education Offices, Newtown Street, Boswells.

Sowerby Bridge.—May 26th. West Riding Education Committee. Electric lighting scheme at schools. Specifications from secretary, Education Department, County Hall, Wakefield.

South Africa.—JOHANNESBURG.—June 14th. Municipal Council. Motor converter and three rotary converters.*
June 2nd. Municipal Council. Cut-outs, fuses, insulating tape, &c.*
KINGWILLIAMSTOWN.—July 8th. Borough Council. Electrical plant, steam-raising plant, steel buildings, h.p. cables.*

South Shields.—June 4th. Electricity Supply Department. Two water-tube boilers with mechanical stokers, economisers, superheaters, and induced-draught plant and feed pumps. (May 16th.) One 6,000-kW turbo-alternator set and condensing plant. (May 9th.)

Thurles.—May 30th. Urban District Council. Crude oil engines, switchgear, distribution system, buildings, &c. (May 9th.)

Ulverston.—Wiring Cottage Hospital. Mr. C. W. Salmon, secretary, Ulverston and District Cottage Hospital, Ulverston, Lancs.

Uruguay.—MONTE VIDEO.—July 8th. State Electricity Works, six 6,000/200-V, 3-phase transformers.*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Australia.—MELBOURNE.—State Electricity Commission.
Three 250-kVA transformers (£871).—British General Electric Co., Ltd.
Fuses and lightning arresters (£1,053).—Electric Equipment Manufacturers Pty., Ltd.
Lead-covered and armoured cable (£9,661).—British Insulated & Helsby Cables, Ltd.
6,600-V circuit breakers (£726).—Ferguson, Pailin, Ltd.
Transformers (£340).—Australian General Electric Co., Ltd.
Fluted strain insulators (£306).—British Insulated & Helsby Cables, Ltd.

City Council.
3-ph. h.p. and l.p. sub-station switchgear (£4,235).—English Electric Co. of Australia, Ltd.
One 2,000-kW rotary-converter, with transformer and accessories (£6,162).—Australian General Electric Co., Ltd.
One 2,500-kW rotary converter, with transformer and accessories (£7,663); a.c. switchgear (£4,917); d.c. switchgear (£4,18.).—Metropolitan-Vickers Electrical Co., Ltd.
Three 350-kVA. 3-phase transformers (£1,266). Weymouths, Ltd.

SYDNEY (N.S.W.).—Public Works Department.
Four 33,000/250-V, single-phase transformers for Port Kembla (£1,530).—Siemens Bros. & Co., Ltd.
Two 50-kVA, five 25-kVA, 6,600/35-V transformers (£572).—Noyes Bros. (Sydney), Ltd.

N.S.W. Railways and Tramways Department.
40 miles bare copper cable (£10,500). Wm. Adams & Co., Ltd.
Five switch-operating storage batteries (£1,454).—Tudor Accumulator Co., Ltd.
Three 1,000-kW converter units (£16,000).—Metropolitan-Vickers Electrical Co., Ltd.

—Tenders.

Belgium.—BRUSSELS.—For the supply of 1,100 metres of armoured cable to the Belgian State Railway authorities, 12 tenders were received, seven being Belgian and one each Danish, Italian, Dutch, French, and German. The prices quoted ranged from 38,115 fr. (by Corvilain & Co., Brussels) to 59,625 fr.

Cardiff.—Electricity Committee. Recommended:—
One 5,000-kW turbo-alternator (£21,155).—British Thomson-Houston Co., Ltd.

Carlisle.—The Town Council has accepted the following tenders in connection with extensions at the electricity works:—
"Sirocco" grit arrester (£2,250); steel structural work, coal bunkers, and columns to carry the bunkers, with roofing, in front of three future boilers (£2,090).—Stirling Boiler Co., Ltd.
Switch control gear for auxiliary motors, &c. (£1,295).—British Thomson-Houston Co., Ltd.
Extensions to switchboard platform at James Street works (£226).—Exors. of D. Clark.

Colombia.—Cartagena Waterworks, Ltd.
Complete boiler-house equipment, including oil storage tanks, for the electric power house at Cartagena.—Babcock & Wilcox, Ltd.

Greece.—According to the daily Press, a contract has been concluded with a syndicate representing the Western Electric Co., Ltd., the General Electric Co., Ltd., and the British Insulated and Helsby Cables, Ltd., for the installation of automatic telephones throughout Greece, at a cost of £3,000,000. The terms of the contract include the complete exemption from all taxes and duties of all materials imported for the construction of the lines, buildings, &c. The contract was secured against the competition of many other foreign firms, including American.

Glasgow.—Corporation. Accepted:—
Special tramway trackwork.—Edgar Allen & Co., Ltd.
The tender was £500 in excess of the United States Steel Products Co.'s tender.

Hammersmith.—Electricity Committee. Recommended:
400 yd. .1 sq. in. l.p. cable, £105; 200 yd. .2 sq. in. ditto, £87; 300 yd. .05 sq. in. ditto, £89.—Hackbridge Cable Co., Ltd.
250 yd. .25 sq. in. e.h.p. cable, £148.—Enfield Cable Works, Ltd.

London.—ST. PANCRAS.—Electricity and Public Lighting Committee.
Steam pipes, separators, &c., required for the two 5,000-kW Ljungstrom turbines at King's Road station.—J. Spencer, Ltd. (£674). (Recommended.)

Wiring for electric lighting the L.C.C. dwellings in Churchway under the Council's small dwellings scheme. The specification provides for about 300 points and 10 rising mains:—

	Per point.	Per rising main.	Total.
Russell & Co.	£2 5 6	£13 3 6	£814
T. H. Smerdon	0 19 0	12 0 0	405
Sims & Sims	0 18 6	8 15 0	365
H. J. Toms & Sons. (Recommended)	**0 10 0**	**7 10 0**	**380**

An estimate has been received for executing the work by direct labour, which is substantially more than the lowest tender received.

SHOREDITCH.—Lighting Committee.—Accepted:—
Cable:—1 mile 7/.064 paper-insulated cable, £81; ¼ mile .5 ditto, £178; ¼ mile .75 ditto, £153; ¼ mile 7/.064 3-core armoured cable, £146; ¼ mile 19/.056 3-core armoured cable, £226.—Siemens Bros. & Co., Ltd.

STOKE NEWINGTON.—Electric Lighting Committee. Recommended:—
Cable for 12 months.—W. T. Henley's Telegraph Works Co., Ltd.

Portsmouth.—Town Council. Accepted, in connection with the extensions to Chichester and Fareham:—
For Cosham sub-station: One 6-panel switchboard (£1,080); one 5-panel ditto (£925). For Fareham sub-station: One 7-panel switchboard (£1,280). For Fishbourne and Bosham sub-stations: Two 7-panel switchboards (£1,190 each).—English Electric Co., Ltd.
L.p. switchgear at Fishbourne and Bosham sub-stations (£245 each).—Johnson & Phillips.
Battery-charging plant for electric refuse vehicles (£372).—Bruce H. Auld and Co.

Sunderland.—The Town Council, on the recommendation of the Electricity Committee, has accepted a German tender for the supply of 500 meters. It was stated that the price, £500, was 50 per cent. less than three British tenders, which were all equal in amount. A proposal to ask the British firms to tender again was defeated.

Councillor Speeding, chairman of the Electricity Committee, said that they would much have preferred to keep the contract in this country, but they were "confronted by a ring."

Councillor Nicholson said that the three British tenders were identical to the odd penny. The Committee regretted it, but the order had to be placed in the cheapest market. Three votes were recorded against the recommendation.

The Council has accepted the tender of the General Electric Co., Ltd., for windings for a turbo-generator.

Swindon.—Town Council. Accepted:—
1,000-kW turbo-generator (Mather & Platt's generator) (£7,283).—J. Howden & Co.

Taunton.—CORRECTION.—The "Contract Closed" notice published under the heading "Swindon," in our issue of April 25th, p. 664, related to Taunton, not Swindon, the Taunton Council having placed orders with Messrs. F. W. Brackett and Co., Ltd., for circulating water screens and accessories and with the Tudor Accumulator Co., Ltd., for battery extensions.

Yarmouth.—Town Council. Accepted:—
Cable for the Pleasure Beach (£831) and for Newtown (£1,342).—British Insulated & Helsby Cables, Ltd.

Forthcoming Events.

Institute of Physics.—Monday, May 26th. At 4.30 p.m. At the Royal Society, Burlington House, Piccadilly, W. Presidential address by Sir Chas. Parsons.

Radio Society of Great Britain.—Wednesday, May 28th. At the Institution of Electrical Engineers, Victoria Embankment, W.C. At 6 p.m. Lecture on "Wireless in British Military Aircraft up to August, 1914," by Major H. P. T. Lefroy.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names of makers or suppliers of:—

GODWIN condensers (wireless).
VIDICO alarm system.
ANGLOVIA auto-flasher.

"Electricity in Service" at Wembley.

By J. W. BEAUCHAMP, Director and Secretary, British Electrical Development Association.

THE load charts of power stations may in the future well take place with blue books and other records as the raw material of the historian, to whom they will explain many of the far-reaching changes now taking place in social conditions, and stand with fuel and food records in importance as an index of economic progress. It is not impossible that they may exhibit in the year 1924 a reaction to the stimulus of the Empire Exhibition, the World Power Conference, and much cumulative publicity, which will alter their characteristic slope of advance and set before the industry a new basis for calculating extensions and building ahead.

Mr. W. A. Gillott, Manager of the E.D.A. Exhibit, and some of his Staff.

In an exhibition so largely electrical that even the generous plans of its promoters narrowly avoided a famine of electricity, it may seem invidious to attach too great an importance to any one display, however considerable, but the displays at Wembley provided by the British Electrical Development Association have an importance to the industry beyond their immediate business-producing objective.

They stand for a sound policy in public utility advertising, to a great extent new to the industry, and they are the result of the first considerable co-operative effort carried out for suppliers of electricity.

The Development Association has now been working for some five years, literally living in a land of opportunities, too few of which it has been in a position to grasp. Growing confidence in its work and value, combined with the stimulus which few have failed to receive from the conception of the Exhibition of Empire, has enabled it to carry to a successful conclusion an enterprise of which the industry need not be ashamed, a co-operative effort supported by every type and size of public supply undertaking. Conceived without expectation of immediate gain, it will prove a real public service returning its cost a thousand-fold, and at least finally dispose of the suggestion that the mixed and often much restricted interests within the industry cannot pool ideas and resources for the common good.

The work has been carried out in pursuit of a definite idea, to present to Wembley's vast crowds a picture of the comfort and grace of daily life which can arise from

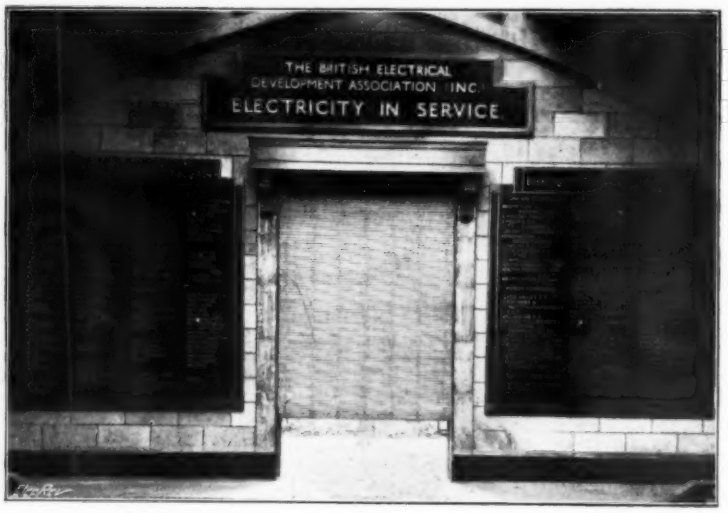
The E.D.A. Exhibit at Wembley.

G

the wide use of electric power, and bring to the public the knowledge that electricity may become more important than fuel, and only less so than food, to the peoples of the future.

The work of the E.D.A. Exhibition Committee, carried on steadily week by week over many months, has been achieved under many restrictions, not all unreasonable, but certainly adding to its difficulties.

Its programme was: to make a display worthy in size and excellence of its setting at Wembley; to give a fair deal to every interest, and show the whole range of modern electrical applications within the limits of Empire manufacture already represented within the Exhibition; and, lastly, to effect its purpose with funds collected from many sources, at the time all too little informed of the greatness of the Exhibition and its meaning to the trade of the country.



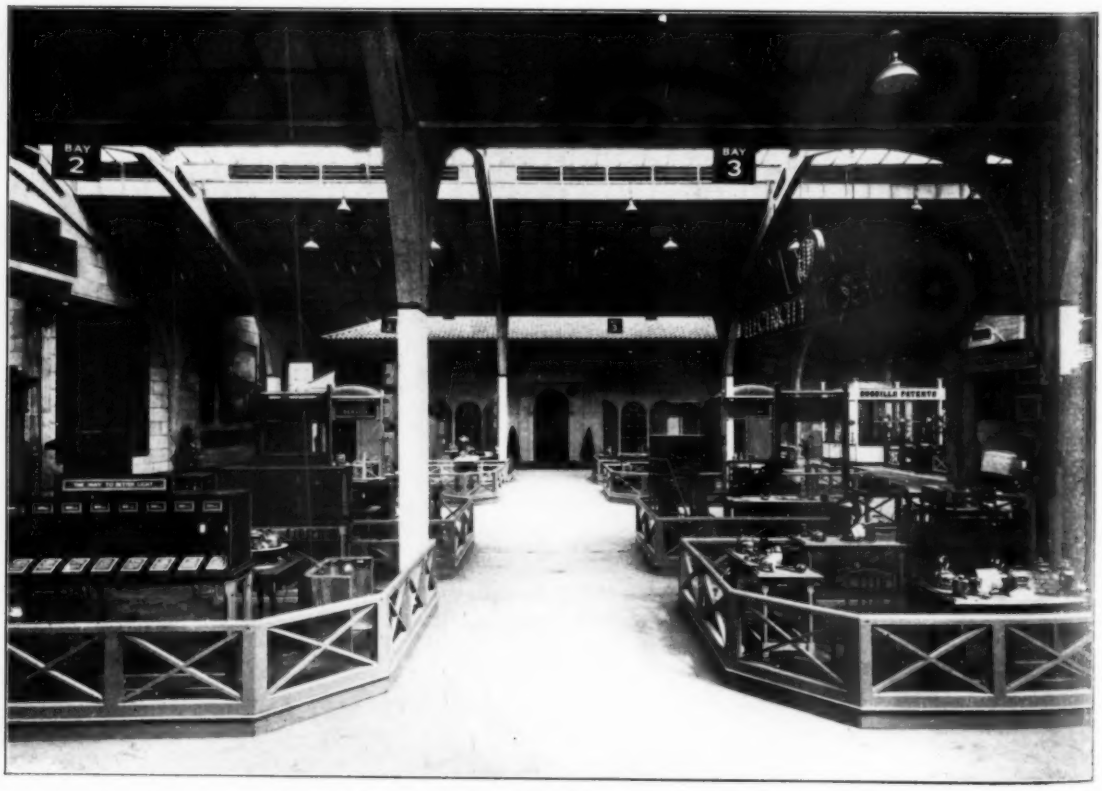
The Faraday Gate with Table of Undertakings taking part in the Display.

A few months of work was, however, sufficient to arouse much sympathetic interest, and in the autumn of 1923 the executive felt justified in taking up space, and soon after was able to put in hand building contracts, happy in the knowledge that the manufacturers and contractors, together with the cable and lamp makers, were willing to provide many thousand pounds' worth of material and labour to equip and stock the 10,000 ft. showroom which had been designed to represent and foster the interest of every supply undertaking which subscribed to the fund for this work.

Subsequent progress was rapid. The committee secured the services of Mr. W. A. Gillott, A.M.I.E.E., as Exhibition manager, and the combination of able architects and energetic builders soon produced tangible results. The enthusiasm to which we are accustomed in the electrical world soon began to emerge, and the whole work moved swiftly to its conclusion, reached on the night of April 23rd, 1924, with not more than the usual allowance of Exhibition tears.

So far as is within its power, the Development Association has borne witness to all this cordial support in mind, money, and material by enrolling the names of the undertakings and associations around the Faraday Gate; by issuing lists of them; and by referring in every possible way to its supporters; the object to be attained being to give the public the impression that many hundreds of important undertakings within the industry have combined to place before them at Wembley a joint display in which there is nothing to sell, but where everyone desires to serve.

The "In Service" exhibit is based upon the idea that the principal appeal would be to the men and women interested in their homes—in fact, that every person who lives beneath a roof would find something of



The E.D.A. Exhibit. View looking toward the Electric House.

immediate interest and value to them, and see in the E.D.A. exhibit a link between the scientific displays of the Palace of Engineering and the ordinary business of daily life.

Taking the electric home as the basis, the exhibits proceed outward from it elaborating the ideas shown in the rooms of the Electric House and proceeding to the use of electricity by the tradesman, the laundry,

Inside the Electric House.

and a thousand and one small industries and businesses dealing primarily with the requirements and services of the home, touching in this way small business which cumulatively offers perhaps the biggest of all the loads which can be taken by the supplier of electricity.

The Association is issuing full descriptions of the stands and exhibits, and details of them would be redundant here.

Many thousands of visitors at Wembley will have some interest, direct or indirect, in the work of the Development Association there, and for their benefit it may be desirable to point out that the committee has had a somewhat difficult task in reconciling a number of conflicting factors. It was necessary to produce an exhibit of very attractive general appearance, something which would appeal to the eye and capture the imagination of the Press.

To provide for many unknown quantities, there was little experience to guide one as to the number and classes of people who might be expected at so great an Exhibition open for so long a time. Arrangements have been made which will permit of dealing with large numbers of people and getting into actual touch with a great many of them on most occasions.

The exhibits had to be entirely British, and were again not unreasonably restricted to the productions of firms who had already taken stands for themselves in the Exhibition.

The class and style of fittings employed were to represent the best modern electrical practice, but it was undesirable that they should be too costly, realising that the great field of business for which the Association is working lies with the middle classes, even if the term is used in rather a wide sense—people who will have comfort, but who want value and are not prepared to spend money merely for the sake of having something expensive.

The staffing of the E.D.A. displays presented much less difficulty than might have been anticipated. A considerable number of men and women with varying experience in electrical work were soon enrolled on the paid staff, and the least experienced of them already displays the keenness and enthusiasm for electrical methods which so rapidly attaches itself to any one entering this business. In addition to the regular staff, arrangements have been made for a large number of electric supply undertakings in different parts of the country to lend some of their assistants for varying periods during the exhibition, and by the time it is over a great many electricity suppliers will actually have had their own people at work in the E.D.A. exhibit. Recognising the tiresome character of long-hour attendance at big exhibitions, arrangements were made for operating generally in two shifts, so that the attendants on the E.D.A. pay roll, or borrowed from supporting undertakings, should have reasonable opportunities of studying the whole exhibition and making themselves acquainted with the electrical life of London.

Close touch is kept between the management and the staff, and the arrangement for securing representation from all districts, coupled with a system of holding statistics, tariffs, and electric supply information on the stands, is calculated to make visitors feel at home (electrically speaking) in this section of the Exhibition.

Already inquiries have become numerous, and where they can be put in anything like definite form they are immediately referred back to the districts from which they emanate with a view to business being followed up.

It has already become obvious that publicity for these exhibits will be to a great extent automatic; descriptive matter and invitations to visit are being sent to other associations and to the promoters of conferences or meetings at Wembley during 1924.

The writer would ask visitors interested, even indirectly, in the electrical industry, members of Councils owning supply undertakings, and directors of companies, manufacturers and their staffs, to lose no time in going round the two exhibits of the Development

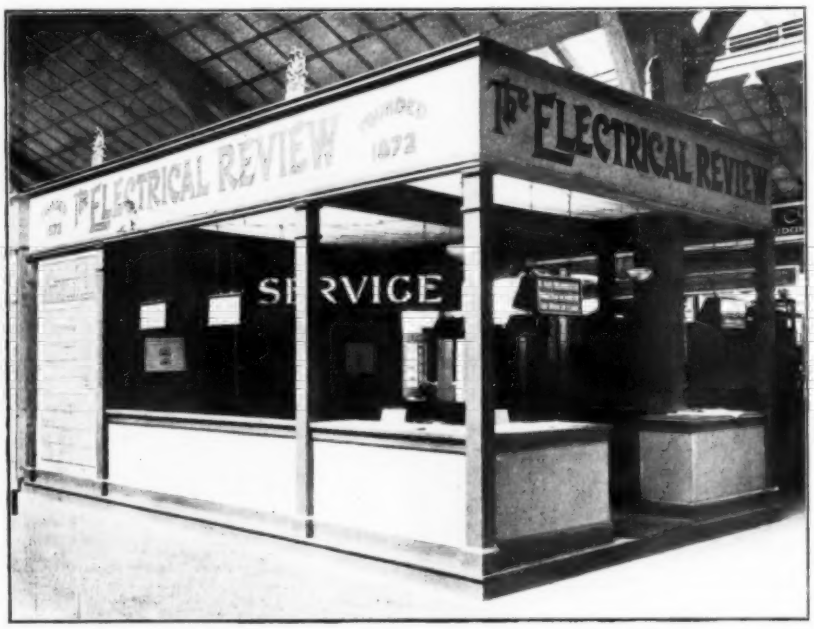
One of the Rooms in the Electric House.

Association, making themselves known to the manager or his assistants at the time in charge, and using to the fullest extent the facilities offered in the Electric House and in the Rendezvous.

The management of the E.D.A. is glad to hear from persons or associations within the industry desiring facilities for meetings at Wembley, and will in every possible way afford assistance and advice.

After the project of the "Electricity in Service" exhibit had been in hand for some time, it was found possible to arrange for an electric farm display on another part of the site. This is now completed in the Eastern section of the grounds adjacent to H.M. Government Building and immediately behind Newfoundland (N.18).

Mr. Borlase Matthews has, on behalf of the Association, put up a very interesting exhibit of the use of electric power on the farm and for the country house. Here he shows his well-known work in connection with making hay without sunshine, milking cows, shearing sheep, the operation of all kinds of machinery, fixed and portable, by means of electric power, and the equipment of the farmer's home or the isolated house for lighting, cooking, and labour-saving by the same method.



The Stand of The "Electrical Review," Limited.

In view of the rapid development of trans-rural power lines, this exhibit will prove of interest to the electricity suppliers as well as to the agriculturist or person who, by choice or necessity, lives in districts where gas is unobtainable and coal difficult to secure.

Here, then, in brief is the story of the "Electricity in Service" exhibits and their object: every reader can do a little to make them effective and also helpful to himself.

The British Empire Exhibition is a big thing, so big that it seems to worry some people. In all the stages of its construction to the present day there have been waves of pessimism to contend with; even now there are those who say, "We will go a little later when it is ready, when the roads are dry, when it is a bit warmer!"

But delays are proverbially dangerous, and circumstances may arise which prevent one from carrying out the projected excursion to Wembley. Moreover, one visit will not suffice—it will merely whet the appetite.

It would be no exaggeration to say that it has been worth the entrance money to see this Exhibition any time in the past six months; to-day it is easily worth it to stand on the terrace of the Stadium and merely look across the site.

To electrical men less than six visits should be unthinkable; there are electrical features in every part of the Exhibition; the writer suggests to every reader who can that he or she should go—go soon—and go often. At the least the visits will pay—at the best they may produce a quite unsinful feeling of pride and determination to be a real burden-bearing brick in the structure of our Empire.

For "The Service" of All.

THE stand of the ELECTRICAL REVIEW, which is situated in Avenue 13, Bays 14/15, is intended to be of use to anybody and everybody electrical when they are visiting the exhibition. The whole idea is indicated by the large sign appearing in the centre of the stand—namely, the desire of the ELECTRICAL REVIEW organisation to be of SERVICE during the exhibition period to electrical visitors, whether from Overseas or from Home.

There will be many electrical men and women who desire information regarding various things, perhaps especially when they are at Wembley for the first time, and we invite them to avail themselves of any knowledge that may be in the possession of those in charge, or of any facilities that we may have provided for their convenience. The facilities and Service that are available may be indicated broadly as follows:—

(1) We have a collection of the most recently published electrical books for the inspection of visitors. While the welcome visitor will not be *asked* to buy, orders will gladly be taken to obtain whatever book may be required as the result of such inspection.

(2) A large number of catalogues issued by British electrical and engineering manufacturers has been brought together; these include those of both exhibiting and non-exhibiting firms.

(3) The latest electrical directories, year books, pocket books, &c., are all placed at visitors' disposal for reference.

(4) Visitors may use our telephone and our staff will type their letters, without charge.

(5) The ELECTRICAL REVIEW Service Department is always open to give any information that it possesses already, or is in a position to obtain. Being at the centre of everything electrical, it generally knows or can get to know, when, where, how and why. If it cannot give the information off-hand it can tell you where you can, in all probability, obtain it—if it is obtainable at all.

(6) The editors or editorial representatives of the REVIEW will be glad to meet overseas and other visitors, preferably by appointment, if they will, as already invited, make known their arrival here. They can telephone through from the Stand to this office, or leave their cards with a member of the staff.

(7) Copies of the ELECTRICAL REVIEW are obtainable at the Stand on the usual terms early on Friday morning.

Above and beyond all the foregoing purposes we may say that the ELECTRICAL REVIEW stand is the place for a hand-shake and a chat, whether information is desired or not. It is a place where we hope to renew many old acquaintances, especially among the host of ELECTRICAL REVIEW friends and supporters who have gone overseas and are coming Home this year.

Some of the Exhibits at Wembley.

The General Electric Co., Ltd.

(*Stand Nos.* 78-83, *Avenues* 11-13, *Bays* 11-15.)

This exhibit has been designed to demonstrate the ability of the G.E.C. to undertake everything connected with the generation, distribution, and application of electricity. The stand covers an area of over 5,000 square feet, the major portion being arranged in two storeys, with the power station, goods handling yard, the entrance to an electric shop, an electric kitchen, main hall, reception lounge, and inquiry bureau, on the ground floor. The upper floor is reached by a staircase and also by an electric lift. On this floor are the sitting room, a large hall for the display of lighting fittings and methods of illumination, and a conference and kinema room, in which films depicting the manufacturing activities of the company will be shown. Showcases containing other products are also arranged on the walls of the first floor.

The most important set installed is a 5,000-kW G.E.C.-F & C. three-phase turbo-alternator (fig. 58). The rotor is in slow rotation, and a section of the turbine casing has been removed in order to allow part of the wheels and blading to be seen. The turbine is of the Fraser & Chalmers standard high-pressure type designed for an output of 5,000 kW when running at a speed of 3,000 r.p.m. and suitable for operating with steam at the highest pressure and temperature met with in practice. It has eleven wheels, each with a single row of blades. The turbine is provided with cast-steel nozzle boxes so that live steam does not come into contact with the main casing; the high-pressure end of the latter is also made of cast steel. An opportunity to inspect more carefully the most important parts of turbine construction is afforded as the exhibit includes a turbine wheel completely bladed, a turbo compressor wheel and a turbo oil pump.

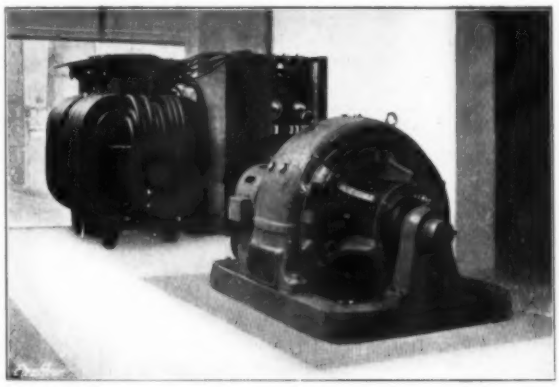


Fig. 57.—G.E.C. 500-kW Rotary Converter, Transformer, and Switchgear.

In order to provide power at suitable voltages for the apparatus which is to be supplied, two step-down transformers together with a rotary converter, are provided (fig. 57). The larger transformer has an output of 550 kVA, the voltage on the h.p. side being 3,300, and that on the l.p. side 340; the smaller has an output of 100 kVA, and is for supplying a 440/220-V network. The rotary converter is rated at 500 kW, 440/500-V, 1,000 r.p.m. The transformers are of the G.E.C. core-type self-cooled oil-immersed pattern.

The rotary converter is reactance controlled. An important feature in connection with it is the starting and self-synchronising panel, which affords a thoroughly reliable and very simple method of starting up. Only three operations are necessary on the part of the attendant; the first of these is closing a circuit breaker to start the motor; the second consists of pushing the main switch into a preliminary position, and the third of pushing it home; this last action short-circuits the starting reactances and automatically trips the circuit breaker of the starting motor. The main switch is prevented from being pushed into the final position straight away by a suitable mechanical device.

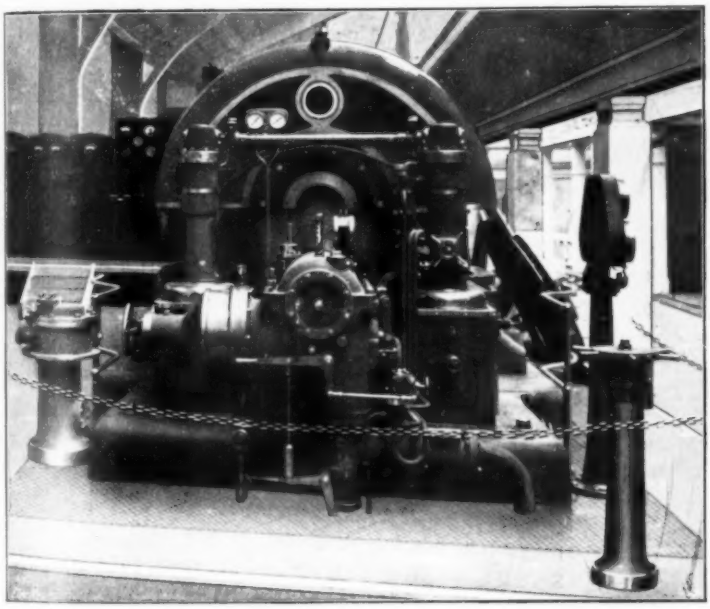


Fig. 58.—Steam End of 5,000-kW G.E.C.-Fraser & Chalmers Turbo-alternator.

Fig. 59.—Main Switchboard.

Fig. 60.—G.E.C. 45,000-V Outdoor Oil Circuit-breaker.

Power house switchgear is represented by a 3-panel truck-type switchboard, which controls the three-phase incoming supply from the Exhibition power house, at 3,300 volts, 50 cycles; the h.p side of the 550-kVA rotary-converter transformer; and the h.p. side of the 100-kVA transformer; the l.p. side of the last is provided with tappings to supply the 440/220-V power and lighting circuits.

There is also a d.c. flat back type of slate switchboard for controlling the incoming supply at 440/220 V, the outgoing supply to the main distribution board, and the d.c. side of the 500-kW rotary converter. These switchboards are shown in fig. 59, p. 843.

A transmission line is shown, connected to a 45,000-V outdoor-type oil circuit breaker (fig. 60), which is of the same design as six switches supplied recently to the Victorian State Railways. The line is protected by gear in accordance with the Isenthal patents.

The plant for industrial application includes a 45-h.p. slip-ring motor for colliery purposes, with totally-enclosed slip-ring cover and trifurcating boxes, together with the necessary control gear. There is also displayed a "Kingsway" miners' lamp charging and hanging rack. The main control unit for the motor is a flame-proof oil-immersed draw-out mining pillar which consists principally of an oil circuit breaker mounted on a pedestal to which are attached the busbar chambers. The design is arranged so that instruments, cable boxes, &c., can be provided as required. A complete system of interlocking ensures the maximum degree of safety.

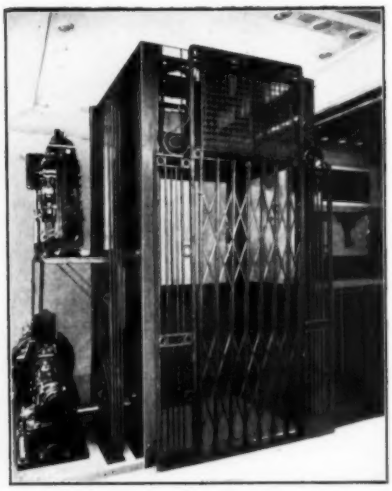


Fig. 61. G.E.C. Express Lift.

Fig. 62.—Electric Kitchen.

For starting the motor a horizontal oil-immersed flameproof drum-type controller is provided. The drum is carried in brackets bolted to the lid, so that when the lid is open the whole of the drum is dead. These controllers occupy very low head room and are operated by a lever whose handle is some three feet above the ground level, which is a very convenient height for the operator.

A typical example of G.E.C. plant for steel works is shown in the 75-h.p. live roll motor (440 V, 40 cycles, 465 r.p.m.), which is controlled by a contactor type of starter with reversing panel, operated by a separate master controller. It is totally enclosed in a very stout cast-steel frame bolted along the axis and so arranged that the top half can be raised for inspection purposes with the utmost ease in a minimum of time. The motor is built perfectly symmetrically so that it can be used for driving from either end. In order to obtain the necessary rapid acceleration, retardation, and reversal, the armature is of very small diameter, thus possessing a low moment of inertia.

For the textile industry is shown a standard Witton loom motor, 3/4 h.p., 220 V, 50 cycles, 720 r.p.m., mounted on the end of a woollen loom. This motor is of the totally enclosed type, the bearings being carried in cast-iron end shields bolted to flanges cast on the end frames. The machine is mounted on a solid cast-iron bedplate, one end of the motor being fitted to the plate and the other end left free resting on a strong steel spring. For the control of this motor a special loom type starting switch has been devised. This is of the ironclad triple-pole quick-break pattern, the entire mechanism being totally enclosed in a steel case.

Apart from the plant and equipment mentioned above several motors of both standard and special desgns are shown together with control units, including a single-phase Witton traction motor, which is typical of a large number manufactured for the London, Brighton and South Coast Railway.

Railway electrification is further indicated by a section of an electric railway car equipped with fittings, fans, &c. Nearby is a display of railway signalling apparatus, including a full-size working exhibit of the Hall colour light signal. The G.E.C. has formed an Electric Traction Department, and has entered into an agreement with the Oerlikon Works, which enables it to utilise the 30 years' traction experience of that company.

Mention should also be made of the Witton-Kramer electric hoist and magnet. The latter is of 66 in. diameter and capable of raising a solid block of about 20 tons.

A working model of a Fraser & Chalmers electric winding engine is shown. This model represents an engine driven through gears by an a.c. motor with a cylindro-conical drum from 12 ft. to 16 ft. in diameter, capable of lifting 5 tons of coal 1,500 feet in 58 seconds. The model is driven by a small motor fitted in the base but is complete in all its working parts, with a Whitmore overwinder and driver's cabin.

Fig. 63.—Electric Bathroom.

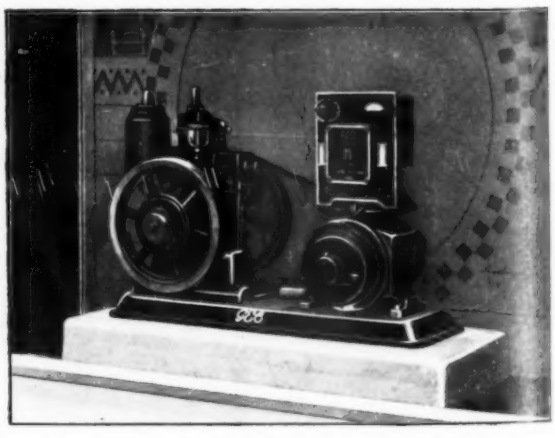


Fig. 64.—G.E.C. Small Lighting Set.

In conjunction with the above a full-size Whitmore overwinder is worthy of inspection.

There is also installed by Fraser & Chalmers Engineering Works a belt conveying plant, by which it is intended to illustrate in miniature some of the special features of the Robins system. The plant consists of a system of conveyors working in conjunction with a storage hopper and belt feeding apparatus.

Ship electrification is represented by an exact replica of a modern liner's cabin fitted with electric fan, radiator, electric light and berth-light, and various other fittings.

A selection of Witton-Kramer electrically-driven portable drills and grinders, and other tools are shown in operation, and "Magnet" soldering irons, glue pots, and other electrically-heated devices are exhibited in show cases.

In a series of show cases, and on the walls, are displays of factory bells, telephones, ironclad switchgear, carbons and batteries.

The illumination of this section is carried out with various

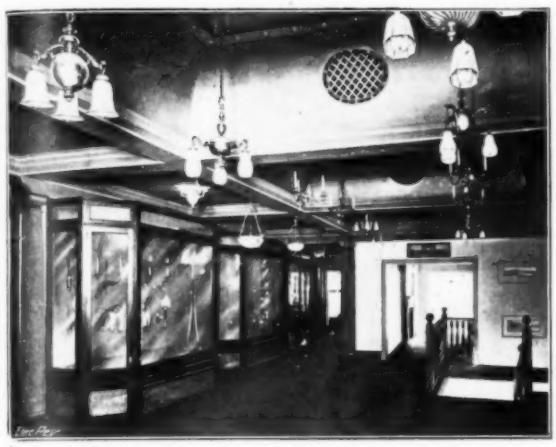


Fig. 65.—Lighting Fittings and Model Shop Windows.

types of G.E.C. fittings, so disposed that increasing intensities of illumination can be demonstrated.

The electric shop occupies one corner of the ground floor and constitutes an exhibit of G.E.C. products forming a complete stock for an electrical retailer's establishment; a demonstration of the most effective method of displaying and stocking electrical goods; and a striking example of the best practice in show window and interior illumination (figs. 64 and 65). The dressing of the windows will be changed from time to time to illustrate various methods of display, and the appropriate illumination.

On the ground floor is a completely equipped electric kitchen (fig. 62) combined with scullery and wash-house. The installation includes a "Magnet" domestic cooker, a plug board, to which kettles, saucepans, and other appliances can be connected, a 10-gal. hot-water tank with immersion heaters and automatic heat control, an electric dish-washer, and an electric

Fig. 66.—Automatic Telephone Exchange.

clothes washing machine. An ironing table with a "Magnet" electric iron is also included. A typical house service with Chamberlain and Hookham meters, G.E.C. main switches, distribution boards, &c., is installed, and an electric service lift connects both shop and kitchen with the upper floor. The sitting-room embodies attractive lighting effects, including colour lighting, while warming-plates, toasters, cigar-lighters and other appropriate electrical devices are installed. Adjoining the sitting-room is a bathroom containing an electric calorifier heated by immersion heaters, lighting fittings of special design, an electrically-heated towel rail, an electric fire, a shaving water heater, a hair dryer, a vibrator, &c.

The whole of the electrical installation of the stand has been designed to form an exhibit of various methods of wiring, lighting, heating, ventilation, &c., using exclusively G.E.C. products.

A 100-line Post Office type telephone exchange in the main hall of the stand is connected to the Post Office system, and extensions run to various sections of the stand, illustrating a private branch exchange under working conditions. G.E.C. intercommunication and direct working telephones are also installed to a number of points on the stand, and an automatic branch exchange (fig. 66) is shown in operation.

Not least in importance is the collection of Osram lamps (of which the company makes 1,500 standard patterns), as well as a great variety of examples of scientific illumination; and the display of Marconi Osram valves and Gecophone radio receiving sets and components, batteries, loud-speakers, &c., would afford material for an article by itself. Valves consuming as little as 0.06 A and as much as 50 A (with a high-frequency output of 20 kW) are shown.

Apart from the exhibits on the stand, G.E.C. lamps, fittings, cables, and accessories are used extensively throughout the whole Exhibition.

In addition to the Fraser & Chalmers exhibit on the main G.E.C. stand this section of the G.E.C. organisation has a stand in the Palace of Engineering containing items of interest to those concerned with mining plant and equipment. These comprise:—A Bettington coal pulveriser, crushing rolls, a 2-stamp battery, a Hardinge conical mill, a Gayco separator, and a model of a single roll crusher.

Metropolitan-Vickers Electrical Co., Ltd.

(*Stand No.* 3, *Avenues* 8-10, *Bays* 7-11.)

A part of this stand is devoted to a display of electric lighting fittings, chiefly of a decorative character, including silk shades, glassware, and "Moonstone" glass, as well as a comprehensive show of "Cosmos" lamps. Numerous other electrical appliances for the home are to be seen on the stand. There are 1-, 2-, and 3-kW bowl fires, and also the well-known

Fig. 67.—Part of the Metropolitan-Vickers Co.'s Stand.

"Cosmos" fires with horizontal elements and beaten copper reflecting backs, in several sizes and designs. There are, of course, kettles, irons, and other familiar appliances. The "radio" side is well represented by a number of complete "Radiophone" sets to suit various ideas and pockets, and there are also examples of the company's "Radiobrix" system by which sets may be gradually built up. The illustration (fig. 67) shows part of the "domestic" portion of the stand.

The Telephone Manufacturing Co., Ltd.

(*Stand No.* 64, *Avenue* 11, *Bays* 6 *and* 7.)

The largest single exhibit of this company is an automatic telephone exchange which is shown in action linking up various points in the Machinery Hall. From fig. 68 it will be seen that the exchange is very neat in appearance and occupies but little floor space. Each line in the board is served by a selector of small size which embodies all the mechanism for selecting the called line and making the required connection. The working parts are few and their movements simple. The possibility of faults developing is therefore minimised, but if necessary the selectors can be quickly disconnected and removed for examination. The selectors are housed in a dust-proof case. The "Laryngophone" is another exhibit. This is operated by the vibrations of the larynx and is claimed to be quite insensitive to external sounds. For this reason it is

particularly useful in noisy machine shops, or on board ship. The principle has been applied to divers' and firemen's helmets. The company also show its intercommunication telephones for dealing with any number of points up to 30. Each instrument acts as its own exchange, the pressure of a button calling the desired station and connecting the two lines. In connection with this the firm exhibits instruments and a number of patterns designed to conform with furnishing schemes, &c. Apart from other telephone apparatus, the stand bears examples of "True-Music" loud speakers for the reception of broadcasting. On the domestic side the company

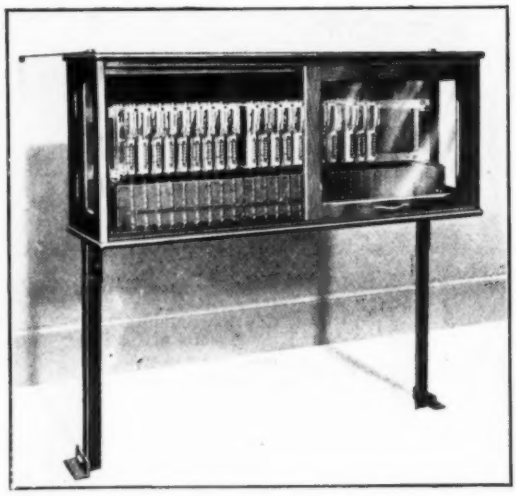


Fig. 68.—T.M.C. Automatic Telephone Exchange.

displays many examples of handsome art-metal ware included in which are electric kettles, coffee percolators, hotplates, &c. The table standard illustrated in fig. 69 is a good example of the art metal work shown.

The British Thomson-Houston Co., Ltd.

(*Stands Nos.* 19 *and* 28, *Avenues* 9 *and* 10, *Bays* 11-15.)

In addition to the heavy electrical plant described in our issue of May 2nd (p. 707), the B.T.H. Co. also exhibits examples of its lighting fittings. These include several "X-Ray" reflectors which are made of correctly-formed glass blanks coated with pure silver. The coating is protected by an elastic enamel which is unaffected by the heat of the lamp. The flood-light projectors which are shown give a powerful concentrated beam or a diffused light by means of a gas-filled lamp. One of the best domestic lighting fittings on view is the "Luxor" (fig. 70), a semi-indirect fitting. Glare is entirely eliminated by means of a diffusing bowl, through which about 25 per cent. of the total light is diffused, the remaining 75 per cent. being reflected upwards to the ceiling from the inner surface of a reflector. For the lighting of shops, banks, hotels,

Fig. 69.—An Art-metal Table Standard.

Fig. 70.—The B.T.H. "Luxor" Fitting.

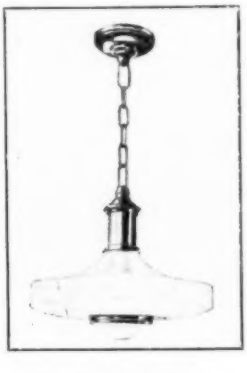


Fig. 71.—The B.T.H. "Keldon" Fitting.

and other large buildings the "Keldon" fitting, illustrated in fig. 71, is suitable. This has an "opalised" bottom portion, which, in addition to giving a perfect diffusion of light, acts as a reflector which directs the light rays upwards through the semi-clear upper portion to the ceiling, whence they are reflected downwards. The "Ace" fitting, for similar applications, is independent of the ceiling as regards illumination, it being provided with a top opalised portion which re-directs the light rays downwards.

"Mazdalux" metal reflectors for industrial lighting are shown. In direct connection with these exhibits the company shows the various stages of manufacture of its gas-filled lamps, together with many examples of the forms in which these are produced.

Mr. John Lightfoot.

(*Stand No.* 148, *Avenue* 15, *Bays* 12 *and* 13.)

The "Lightfoot" tubular electric heating system is shown upon this stand. This system consists of steam or water pip-

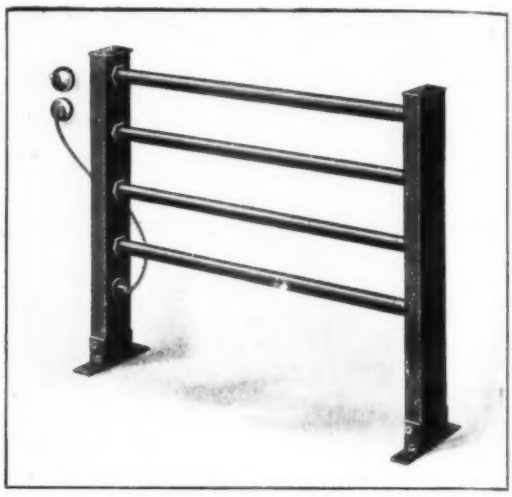


Fig. 72. A "Lightfoot" Tubular Portable Radiator.

ing combined with a special patented electrical heating element which forms the interior of the tubes. By means of this system a low uniform heat can be obtained all over a room, the loading of the tubes ranging from 40 watts per ft. (158 deg. F.) to 60 watts per ft. (205 deg. F.). The tubing can be sectionalised so that uneven heating may be obtained if required, and also to avoid rising to clear doorways. The tubing is also made up in the form of towel rails, garage heaters, and portable radiators. For shop-window heating a rather lower loading is employed. Fig. 72 shows a typical portable radiator of the tubular pattern. Another exhibit on this stand is the "Litent" reflector fitting, which is designed for use in explosive atmospheres.

British Electric Transformer Co., Ltd.

(*Stand No.* 21, *Avenue* 10, *Bays* 5-7.)

In addition to the transformers which will be referred to in a later issue, the company has an exhibit of electric heating and cooking plant embracing all the well-known "Tricity"

Fig. 73.—A "Tricity" Cooker.

specialities. The apparatus is tastefully arranged in and around a building of dignified design, the interior of which is laid out as a kitchen at one end and a living room at the other. Fig. 73 shows a cooker for 7 to 10 persons, specially designed for hiring and housing schemes.

The company's activities in this department cover all sorts of domestic utilities, ranging from the tiniest forms of table toaster up to large combination cookers for use in canteens, hospitals and battleships.

No flexible wires nor beaded leads are used in the "Tricity" apparatus, all connections being of nickel-plated steel carried

on "steatite" insulators. All terminals and live parts are carefully protected by earthed shields against accidental contact, and perfection of control is obtained by no fewer than fifteen "heats" on each oven.

The various electric fires built by the company also cover a wide range of designs, from the "Baby" fire through a whole family of "Flamingo" fires to examples of the Adams and Renaissance periods. Special attention has been directed to showing heaters giving wave lengths suited to the various requirements of different sections of the community. Export matters are cared for by designs embodying the basic use of sheet-steel frames, arranged for packing flat and for subsequent assembly by agents. Many of the smaller heating units are fitted on "universal voltage" lines, by means of a suitable wall plug for putting the heat elements either in series or parallel.

The Jackson Electric Stove Co., Ltd.

(*Stand No.* 24, *Avenue* 10, *Bay* 4.)

This company has a large collection of heating and cooking apparatus. One appliance shown is a ship's grill similar to that illustrated in fig. 74. This has a sheet-steel body and a cast-iron top, with a rail all round to prevent dishes, &c., from slipping off. At the bottom is a drawer, into which fat drains. The heating elements are of the firm's standard fireclay pattern, suitably protected by a wire-mesh guard, the connections being of solid rod or strip supported on porcelain insulators. The cooking space measures 18 in. by 14 in. The loading is equivalent to 3.6 kW, and is controlled by a three-heat switch. A standard steaming oven is shown and there are seven or eight of the firm's standard cookers of various sizes, ranging from that for the *ménage à deux* to those capable of cooking meals for nine persons. All these have the common characteristics of three-heat switches and accessible fuses; they are constructed of cast-iron and steel plate, combining lightness with strength; the boiling plates are of the open type; the elements are protected by steel guards and are easily replaced; and the connections are made by solid rod as far as possible. Several types of water boilers are shown. The bath-water heaters have immersed elements which are securely fastened to the lids, enabling them to be withdrawn with ease. The loadings range is from 2 to 4 kW, with tanks of from 12- to 24-gal. capacity. In the urn type of water heater, the elements are in the base, and it is claimed that their substantial construction prevents their being burnt out,

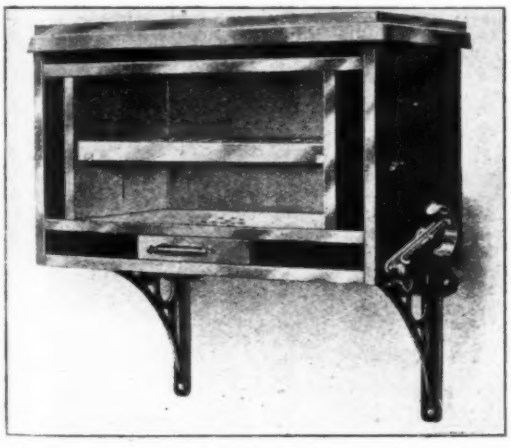


Fig. 74.—A Jackson Ship's Grill.

even if there is no water in the urn. The electric wash boilers shown are constructed on the same principle. Fires of various designs form another section of the exhibit; several types of element are employed in these, including the reflector type, in which a backing of polished metal is fitted. A useful design is the "Cheery" fire, which has a reflector back and a trivet for boiling purposes. Other appliances shown are hotplates, fish pans, immersion heaters, and kettles.

Notes.

Battery Acid Charts.—We have received a useful chart showing the correct specific gravity of accumulator acid that should be used for various types and makes of batteries. The General Chemical and Pharmaceutical Co., Ltd., informs us that the chart has been prepared in close collaboration with the various battery makers as a guide to the correct acid to be ordered in each case.

Radio Communication in Underground Mines.—According to Mr. J. J. Jacosky, assistant engineer, Department of the Interior, U.S.A., who is making a special study of the matter at the Pittsburgh experimental station of the Bureau of Mines, the development of a line-radio system by which trolley wires, mine tracks, compressed air and water piping, cables and similar carriers are utilised for voice-transmission purposes, promises the solution of the difficult problem of establishing a method of communication between underground mine workers and the surface which would be reasonably sure to withstand the severe disturbances occasioned by mine explosions. In tests recently conducted in a coal mine 400 ft. deep no difficulty was experienced on the surface in receiving radio messages from a transmitting set mounted upon a mine locomotive as long as the apparatus was in the vicinity of metallic carriers. The Bureau of Mines experiments indicate that the transmitting range of a radio set in the average coal mine is only a few hundred feet when no conductors are present, but may be several thousand feet when operating in proximity to metallic carriers. The Bureau found that breaks in the metallic conductors did not completely stop communication. Fire, falls of rock and roof, explosions, mine flooding, and other mine disasters which might cause one or more breaks would not completely destroy the conductors, and communication between underground workings and the surface could probably be established.—*Reuter's Trade Service* (Washington).

Electric Vehicles at Edmonton.—It is interesting to recall that about twelve months ago the Edmonton Council decided to discontinue the use of electric vehicles and return to horse haulage by contract in connection with refuse collection. But to-day the position has been reversed, and after twelve months of horse transport, the electric vehicles are being overhauled and re-commissioned. In this connection the Council has placed an order with the Chloride Electrical Storage Co., Ltd., for five new Exide-ironclad batteries. The "Electrics" are to re-commence duty on June 1st, and results will be looked forward to with considerable interest by all who are interested in modern methods of transport.

Local Societies.—TEXTILE MILL DRIVES.—At the Blackburn Chamber of Commerce, on May 14th, Mr. R. H. Friend, A.M.I.E.E. (of the English Electric Co.), dealt with "The Electric Drive in Textile Mills and its Advantages," and in the discussion that followed, the Town Clerk (Sir Lewis Beard) said there was a time when it was considered hopeless to use electricity in an old mill, but those who followed the evidence given at recent inquiries at Preston and Burnley must have been satisfied that if electricity had not come into its own, it was coming very fast. Electricity would come into cotton mills, and those who used it soon would be ahead. Mr. W. Baldwin contended that the running costs of an electric drive were double those of a steam drive. In considering the two systems, manufacturers became confused, especially in the absence of definite data, which supporters of the electric drive were not in the habit of supplying.

Mr. J. A. Ormerod, J.P. (cotton manufacturer) said that with a modern steam engine there was no irregular running. The best way to increase production was by buying better cotton. Mr. D. M. Hollins (Northrop Loom Co.) said his experience confirmed the view that electricity was the most useful medium one could have for driving. In Lancashire it was a debatable point among manufacturers whether steam or electricity was better. In some cases it was steam and in others electricity, but it largely depended on conditions. He was convinced that before many years had passed electricity would be supreme.

Mr. A. W. Heyworth, J.P. (cotton manufacturer) said information was required by which manufacturers could get at the facts as to the relative merits of steam and electricity. Recently one of his mills had changed to electricity, and he was looking forward to the results with confidence.

Mr. Friend, in reply, said there was nothing to prevent manufacturers installing electric boilers to generate steam for taping beams and heating mills. He claimed that without any change in the quality of cotton, electricity would increase production. There were real advantages to be gained from the adoption of the electric drive. Electricity was particularly successful for looms. The higher running speed they attained meant bigger wages for the operatives. Electricity also meant a saving of space in mill area. Costs were not nearly so heavy as some people believed. The initial cost generally worked out at less than that of putting in an up-to-date steam plant. Moreover, a change-over from steam to electricity could be carried out without closing down the mills concerned.

MINING ENGINEERS' WORKS VISIT.—Members of the West of Scotland Branch of the Association of Mining Electrical Engineers recently paid a visit to Shotts Works (Shotts Iron Co., Ltd.), where they saw the application of electricity to the manufacture of iron, coal production, and brick-making. At Northfield Colliery, which was visited, all power, including winding, is electric. A luncheon was afterwards provided by the directors of the Shotts Co.

The Electrical Engineers' Ball.—We are pleased to learn from Messrs. A. M. Sillar and W. S. Lonsdale, the joint honorary secretaries, that owing to the great success of the Electrical Engineers' Ball, held on February 22nd, the committee, at the general meeting held on May 14th, was able to distribute out of the surplus fund the sum of £75 each to the Institution of Electrical Engineers' Benevolent Fund and the Electrical Trades Benevolent Fund.

Fatalities.—An electrical fatality at Newton Cap Colliery, Bishop Auckland, Co. Durham, was investigated by the local coroner on May 16th. The deceased man was John George Douthwaite, who was the driver of an electrical coal-cutting machine. Charles Coates, who was working with Douthwaite, stated that he heard the latter shout. When he went to Douthwaite he found that his hand was on the switch. When he touched Douthwaite he received a shock, which threw him over.—George Robert Nicholson, electrician to the company, said that after the accident his first inspection of the coal cutter revealed nothing wrong. He tested it, and he found that a wire from the earth lead had come into contact with an abrasion on one of the live wires, and so electrified the whole machine. He had examined the machine three weeks before, but did not examine the plug internally. He did not think that the design of the plug, so far as the plug-box was concerned, was satisfactory. He thought that the earth wire had been forced from its socket.—Mr. A. M. Bryan, mines inspector, expressed the opinion that the plug was defective.—The former witness said that it was intended in future to sweat the cable into the socket and hold it in position by a screw, to use tapered cones on the plug body, and fix a steel cover to prevent dirt getting into the plug.—A verdict of "Accidental death" was returned.

Electric Haulage on French Canals.—A system of electric haulage by means of a 10-h.p. electric motor tractor carried along an aerial cable is being experimented with under official supervision on the Marne-Rhine Canal at Liverdun. Tests, which have been made along a stretch of water two kilometres in length, where barges have to pass through a tunnel, 180 yd. long, over a bridge, through a lock, and through an area where loading and unloading is in progress, have proved very satisfactory.

The tractor, which has been built on the principles of M. Chéneau's patents, weighs a little over half a ton (600 kilograms). It runs along a steel cable supported on horse-shoe-shaped brackets every twenty yards, these brackets being in many cases suspended on cross cables stretching from one side of the canal to the other. The carrying cable is gripped between two horizontal pulleys. Their grip is greater when the strain on the hawser attached to the barge becomes more intense, so that the friction is proportional to requirements. The power is transmitted from a second cable running parallel to the carrying cable.

A barge loaded with 280 tons of cargo was drawn by the tractor satisfactorily over an experimental kilometre, half of which ran under a tunnel. Another barge, which belonged to the Société Marcheville-Daguin, and a Seine *péniche* were drawn with equal facility through the Liverdun wharves and the twelve-arched canal bridge crossing the Meuse Valley at this point.

Hardness of Electro-Deposited Metals.—The work described by Mr. D. J. Macnaughtan, A.Inst.P. (of the Research Department, Woolwich) in a paper read at the annual May meeting of the Iron and Steel Institute is part of a general research in progress on the electro-deposition of metals, in which the factors controlling adhesion, soundness, strength, and ductility of thick deposits are being investigated. The results have a practical application in the restoration to their original or intended size of worn or otherwise undersized parts of steel, cast iron, &c., by the electro-deposition of a suitable metal. Although no assumption is made of a direct dependence of resistance to wear upon Brinell hardness, it is evident that the large variation in hardness resulting from variation in conditions of deposition is of considerable importance.

The hardness of electro-deposited metals is frequently referred to in electro-plating literature, but the statements published are often of a contradictory character, probably due not only to the absence of records of any but a few isolated quantitative hardness tests—chiefly scratch tests—but also to the lack of any systematic correlation of the observed hardness with the conditions of deposition. The experimental work recorded by Mr. Macnaughtan is an attempt to correlate from the results of a number of experiments the Brinell hardness, microstructure, and conditions of production of certain deposits of iron, nickel, cobalt and copper. Some consideration is given to the possible causes of the range of hardness obtained, and the paper may be summarised as follows:—

The Brinell hardness numbers of the deposits obtained under the conditions described range between the following limits: Copper 58-66, iron 140-360, nickel 180-420, cobalt 270-311. The conditions of deposition which, within certain limits, have been found to cause increase in hardness are: (*a*) Decrease in temperature (iron deposits); (*b*) increase in current density (copper and iron deposits); (*c*) decrease in metal ion concentration (nickel deposits); (*d*) increase in hydrogen ion concentration (iron and nickel deposits).

Of these conditions the first three coincide with the factors which, according to Bancroft, cause decrease in the crystal size of deposits; and the fourth has been noted by various investigators, such as Hughes (iron deposits) and Thompson (nickel deposits) to favour small crystal size. By the judicious adjustment of the various factors referred to above, the hardness of deposits of iron, nickel, and cobalt can be controlled within fairly close limits. Several possible alternative explanations of the high hardness of certain deposits have been discussed; they respectively ascribed the hardness to—(*a*) Hydrogen deposited simultaneously with the metal, forming a hard solid solution with it; the amount of hydrogen retained in solid solution seems insufficient to account for the high hardness attainable. (*b*) Deposition of the metal largely in the amorphous condition; this is thought to be improbable. (*c*) Displacement of atoms from their normal positions on a crystal lattice by electrical forces acting on them while they are being deposited, resulting in distortion of the crystal lattice growing, with consequent deformation, partly permanent and partly elastic, thereby producing an effect similar to that of cold-work; it does not, however, appear likely that the forces of crystallisation can be affected by the electrical forces involved during deposition. (*d*) The minute size of the crystals of the deposited metal; the deposition of hydrogen with the metal may be one of the factors interfering with crystal growth, and thus reducing the size of the crystals.

Appointment Vacant.—Assistant chief mechanical engineer (£850), for the New Zealand Government Railways. (See our advertisement pages to-day.)

Financing Railway Electrification in France.—As the French railways cannot under present circumstances carry into effect their schemes for installing electric traction on the suburban lines around Paris and on other lines where the use of electric traction commends itself, the sixteen principal manufacturers have formed a financial company with the object of advancing the necessary funds. The big banks in Paris have given their assistance in the creation of the Société Financière et Industrielle de Chemins de Fer. An organisation of a similar kind, which is destined to help the railways to place their orders for Westinghouse pneumatic brakes to be used on the goods trains, in accordance with international convention, has been formed also with the assistance of the banks by Schneider et Cie., Freins Westinghouse, and the Société des Moteurs à Gaz et d'Industrie Mécanique. Neither concern will commence operations before the autumn.

Trade with Australia.—During the run of the British Empire Exhibition a Congress of Commercial Travellers' Organisations throughout the Empire will take place in London. Representatives will be present from Canada, Australia, South Africa, and New Zealand. The object of the Congress is to confer regarding many interests (such as transportation, commercial travellers' privileges, &c.) which the associations have in common, and concessions regarding these benefit funds, residential clubs, and the protection and advancement of the interests of commercial travellers generally. A leading feature of the Congress will be the promotion of trade within the Empire. In this respect, Mr. James Davies, O.B.E., general secretary of the United Commercial Travellers' Association of Australia and editor of *Australia To-day*, who will be one of the delegates from Australia, wishes to get into touch with commercial and manufacturing interests desirous of opening up trade relations with that Dominion. The Australian C.T. Association is a powerful body, with a chain of residential club-houses throughout the Commonwealth, and makes a special function of arranging for representation there for oversea firms. The Australian body has established London headquarters in an elaborately furnished reception room in the Australian Pavilion at the Empire Exhibition at Wembley, where Mr. Davies can be consulted after his arrival in London from Australia on July 3rd. Mr. Davies is intimately conversant with trade conditions in Australia, and will be glad to tender information and advice to firms desirous of obtaining this. The Empire Congress of Commercial Travellers' Organisations has been convened by the Commercial Travellers' Association of Great Britain and Ireland, whose secretary is Mr. F. Coysh, 34, Red Lion Square, London, W.C.1, to whom inquiries may be addressed in advance concerning Mr. Davies's movements.

Electrical Machinery in the South African Mines.—The following returns, compiled by the Mines Department of South Africa, show the value of the electrical machinery purchased by the S.A. Mines in 1913:—

	S.A. (including Rhodesian) Products.	Imported.	Total.
	£	£	£
Electrical machinery	1,338	432,656	433,994
Electrical Machinery Spares and Fittings	6,499	130,881	137,380
Electric Light and Power (purchased)	1,549,505	—	1,549,505
Electric Detonators (or Electric Fuses)	10,811	4,782	15,596

Details of electrical machinery purchased during 1923, including fittings for power and lighting as above.

	£
Electric Generators and Engines driving same if directly driven	34,701
Electric Hoists, including Motors	18,173
Electric Locomotives	14,538
Electric Motors driving Pumps, including Pumps if directly driven	26,945
Electric Motors not included above	77,546
Power Lines, Transformers, &c.	142,347
Electric Bells, Telephones, and other Fixtures ...	19,271
Miscellaneous Machinery not particularised above ...	70,479
Total Value	£433,994

An Oil-Electric Locomotive.—The General Electric Co. has just built a new type of electric locomotive which will use oil as fuel, the first of its kind manufactured in the United States. The engine has been specially designed for switching service, and will be tested in the New York yards of the New York Central Railroad.—*Reuter's Trade Service* (Schenectady).

National Association of Supervising Electricians.—HIGHFIELD SHIELD COMPETITION.—The second annual competition for the W. E. Highfield Shield took place on May 13th. The chair was occupied by the president, Mr. W. E. Highfield, and ten papers were submitted, which were read by members of the Board of Control. The ballot vote resulted as follows:—First: "Installation in Practice," by W. J. Revell. Second: "Electrical Advertising," by R. W. Whitley. Third: "Electricity as Applied to Navigation," by R. W. J. Stark. Mr. W. J. Revell was therefore the winner of the Shield and the first prize, a standard lamp, done in silver, representative of one of the lamp-posts at the British Empire Exhibition, presented by the General Electric Co., Ltd. Mr. Whitley received the second prize, value £3 3s., presented by Callender's Cable & Construction Co., Ltd.; and the third prize of £2 2s., presented by Mr. F. T. Alldread, went to Mr. Stark. The special Associate Member's prize of £1 1s., presented by Mr. R. W. Whitley, was awarded to Mr. T. V. Harding for his paper on "Maintenance and Fault Finding."

The decisions were received with applause, and it was evident that the valuable work Mr. Revell had done for the Association had not been forgotten. Mr. Highfield, in presenting the shield, said it was a personal pleasure to hand it to one for whom he had the greatest admiration, and complimented the audience on its excellent judgment in deciding the winners, and the winners on their papers.

Consulting the Consumer.—In the agenda for last Wednesday's meeting of the St. Pancras Borough Council, the following motion by Alderman F. L. Combes appeared:—"That it be an instruction to the Electricity and Public Lighting Committee to invite representatives from the St. Pancras Traders' Association and the Brookfield Estate Tenants' Association, as representing large and small consumers, to attend the Electricity Committee's meetings with a view to their advising the Committee so as to more nearly cater for consumers' wants."

Educational.—SUNDERLAND TECHNICAL COLLEGE.—The Sunderland Corporation is proceeding with a £20,000 scheme for additions to its technical college and the purchase of new machinery, including electrical plant, so that when the scheme is completed the college may be affiliated to Durham University, and students at the college will be able to take the B.Sc. degree of Durham University.

Institution Notes.

Institution of Electrical Engineers.—KELVIN CENTENARY.—On the occasion of the celebrations in connection with the centenary of the birth of Lord Kelvin, which will be held at Glasgow University on Commemoration Day, June 25th, Dr. Alexander Russell, F.R.S., President of the Institution of Electrical Engineers, will give the Memorial Oration. Lord Kelvin was three times President of the Institution of Electrical Engineers, and Dr. Russell is an old pupil of his.

A.M.I.E.E. EXAMINATION.—The results of the A.M.I.E.E. examination of April last have been announced. Forty-two candidates passed the whole examination, one passed Part I, and five passed Part II only. Results relating to candidates who sat for the examination abroad will be published later. The A.M.I.E.E. examination held at Chatham resulted in 38 officers of the Corps of Royal Engineers being successful.

By courtesy of the Post Office, the chairman of the Wireless Section invites members to visit the Northolt radio station of the General Post Office on Saturday, June 14th, at 3 p.m. Those desirous of taking part in the visit should advise the secretary of the Institution, when particulars as regards trains, &c., will be forwarded.

Scottish Tramway Association.—ANNUAL CONFERENCE.—The annual conference of the Scottish Tramways Association, which was held at Rothesay, was attended by 31 delegates. It was agreed to hold the next conference at Ayr.

Institute of Metals.—AUTUMN MEETING.—The annual autumn meeting will take place in London from September 8th to 11th inclusive. On September 8th, in the evening, the third annual autumn lecture will be delivered at the Institution of Mechanical Engineers by Mr. W. M. Corse, S.B., of the National Research Council, Washington, D.C., U.S.A., honorary corresponding member to the Council for the United States. On September 9th, the morning will be devoted to the reading and discussion of papers. Afterwards members and their ladies will be entertained to luncheon. The afternoon and evening will be spent at the British Empire Exhibition, Wembley. In the morning of September 10th, further papers will be presented for discussion, the afternoon being devoted to visits to works or other places of interest. A reception will be held in the evening at the National Physical Laboratory, Teddington, and an excursion is being arranged for September 11th.

Institution of Public Lighting Engineers and Superintendents.—AUTUMN CONFERENCE.—At the meeting of the Council, held in London in February last, it was resolved to strengthen the executive by the inclusion of the following members of Council:—Mr. Walter Henry Chapman, development engineer, Metropolitan Electric Supply Co.; Mr. Ernest M. Severn, public lighting superintendent, South Metropolitan Gas Co.; Mr. Robert Beveridge, public lighting superintendent, city of Edinburgh; Mr. Robert Davison, public lighting superintendent, city of Newcastle-upon-Tyne. These, with the following existing members, now constitute the Council, *viz.*:—Mr. S. B. Langlands, J.P. (Glasgow), president; W. J. Liberty (City of London), vice-president; Mr. Thomas Wilkie, public lighting superintendent, Leicester; Mr. Robert Mason, public lighting superintendent, Birmingham; Mr. E. F. Spurrell, borough surveyor, Holborn Borough Council; Mr. W. Chambers Smith, M.Inst.C.E. The Autumnal Conference will take place at Glasgow. On September 16th, members and delegates will be officially received by the City Corporation and entertained at luncheon at the City Hall. On the same day the President (Mr. Langlands) will give his presidential address, and papers will be read on the 16th and 17th, whilst on the 18th it is hoped to visit Edinburgh. Further details will be issued later.

Our Personal Column.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the* ELECTRICAL REVIEW *posted as to their movements.

The officials and staff of the Hull Corporation electricity undertaking presented a chiming clock to Mr. R. R. BEARDSHAW on his retirement from the position of works repair superintendent after a period of service extending over 32 years. Major H. Bell, city electrical engineer and manager, made the presentation. Major Bell drew comparisons between the original station and plant opened in Dagger Lane in 1892, of the running of which Mr. Beardshaw had sole charge, and the existing generating works at Sculcoats.

The *British Chamber of Commerce Journal*, of Shanghai, states that Mr. A. Y. TAIT, of the Shanghai Electric Construction Co., Ltd., has been transferred to Singapore. He left for that port on March 18th.

Sydney City Council has approved the recommendation of the Electricity Supply Committee that Mr. MALING, deputy general manager of the electric lighting undertaking, be sent to Great Britain and America, at a cost to the City Council of £1,500, for the purpose of securing information which Mr. Mackay requires in respect of further developments at the City Council's power house.

Colonel CROMPTON's old associates and pupils are entertaining him to dinner at the Royal Automobile Club in London on Saturday, May 31st, his 80th birthday. Fifty persons have already intimated their desire to be present. We are asked to state that as far as practicable notices have been sent to all whose addresses are available, but in case any names should have been omitted of those who wish to partake in the function, they are requested to communicate with the hon. secretary, Mr. E. J. FOX, the Stanton Ironworks Co., Ltd., near Nottingham.

The May issue of *Current Opinion* contains an announcement by Mr. JOHN AMES of the resignation of his post as general secretary of the *Industrial League and Council*. No further editions of the paper will appear. The writer states that the League has completed the first stage of the work that it set out to accomplish. The work of the League is to be reorganised.

Mr. GEO. V. TWISS, M.I.E.E., announces that as from December 31st last he has relinquished his position as consulting director of the Twiss Electric Transmission, Ltd., and has also resigned his seat on the board and completely severed his connection with that company, in order to be entirely disinterested as regards manufacturing and contracting interests. He will devote himself exclusively to his consulting practice at his office at Broad Sanctuary Chambers, 11, Tothill Street, Westminster. Mr. Twiss, who was, early this year, elected a Member of the Association of Consulting Engineers, has taken into partnership Mr. J. N. R. Perks, M.A. (Cantab.), A.M.I.E.E. The style of the firm will be G. V. Twiss & Co.

MR. FRANK A. NEWINGTON, on his retirement from the post of engineer and manager of the Edinburgh Corporation Electricity Department after 28 years' service, was presented on Friday last week with gifts from the staff and workmen of the department. The presentation was made by Mr. E. Seddon, interim engineer and manager, while Mr. A. Mears also paid a tribute to the retiring manager. The lady members of the staff made a presentation to Miss Newington. Mr. Newington thanked the staff for the loyal support they had given him in carrying out his duties during an important period in the history of the undertaking.

Mr. I. LOCKWOOD, assistant in the Mains and Distribution Department of the West Ham electricity works, who is leaving to become distribution engineer to the Sunderland Corporation Electricity Department, has been presented by his colleagues with a canteen of cutlery.

Mr. B. SANKEY, the general manager of the Gas and Electricity Supply Department and chief engineer to the Tramways Department of the Johannesburg Municipality, was leaving South Africa about May 9th for a visit to England, and will arrive in London about the beginning of June. He has been commissioned by the Johannesburg Council to investigate and inspect some of the latest power stations and tramway systems at home, and to investigate the question of pulverised fuel firing, amongst other matters. His home address will be: C/o the Johannesburg Council's London Agents (Messrs. E. W. Carling & Co., St. Dunstan's Buildings, St. Dunstan's Hill, London, E.C.3). Mr. Sankey hopes to attend the I.M.E.A. Conference at Chester, and is also one of the South African delegates to the World Power Conference at Wembley.

Mr. WM. T. TALLENT-BATEMAN will be sailing for Bombay in a few weeks' time in order to inaugurate in that city a branch of Messrs. Ferguson, Pailin, Ltd., switchgear specialists, Higher Openshaw, Manchester. He will represent that firm in India, Burmah, and Ceylon. Mr. Bateman has resigned his directorship of Messrs. Dorman & Smith, Ltd. He was formerly chief switchgear engineer to the British Westinghouse Co. (now the Metropolitan-Vickers Co.).

The decision of the Tees-side Railless Traction Board to increase the salary of the manager (Mr. J. B. PARKER) by £100 a year came in for criticism at a meeting of the Eston Urban Council on the 14th inst. This authority has a joint interest with Middlesbrough Corporation. Coun. P. McPartlan moved that a letter of protest should be sent to the Board, maintaining that the increase had been camouflaged by the appointment of Mr. Parker to the new post of traffic superintendent. Mr. Parker, he said, had not been in office three years, but during the time he had had his salary raised from £500 to, in cash and kind, £800. Coun. W. G. Grace, who is chairman of the Board, said that since Mr. Parker took charge, there had been a tremendous improvement all round, and in the considered opinion of the Board, the increase was justified. The motion of protest was carried by a single vote by 8-7.

Obituary.—DR. C. E. L. BROWN.—It was with great regret that we announced last week the death of Dr. C. E. L. Brown, a founder of the firm of Brown, Boveri & Co., of Baden. Mr. Brown was the son of the late Mr. Charles Brown, who at one

The late Dr. C. E. L. Brown.

time held an important position in the engine works of Sulzer Bros., Winterthur, and subsequently practised as a consulting engineer in Basle. In 1886, when barely 23 years old, Mr. C. E. L. Brown was already the director of the electrical department of the Oerlikon Engineering Works, and from that year dates the great part he took in the development of electrical machinery for the generation, transmission, and utilisation of electric power. A landmark in this connection was the demonstration, by means of the Lauffen-Frankfort 110-mile transmission (1891), of the commercial feasibility of the transmission of power over great distances by electricity in the form of three-phase alternating current. This gave a great impetus to the development of electrical power transmission all over the Continent of Europe, and in connection with the demand which ensued for suitable electrical machinery Mr. Brown brought out in a very short time a series of new constructions of great originality, which proved highly successful in practice.

In 1891, in association with Mr. W. Boveri, Mr. Brown founded the works of Brown, Boveri & Cie., Baden, Switzerland, many of whose present-day designs bear the impress of the original ideas of the technical founder of the firm. Starting with a few men, the Brown-Boveri organisation employs to-day not far short of 10,000 men in the production of heavy electrical and steam turbine machinery, and sends its products to every part of the world. During the years 1891 to 1911, Mr. Brown took a great personal part in the development of his company's manufactures, devoting most of his energies to polyphase alternating-current machinery and apparatus. Many important installations were put down during the nineties, including the Frankfort Electricity Works (1894), the noteworthy Paderno-Milan transmission (1897), and the first electric railway lines operated by three-phase current in Europe. In 1911 Mr. Brown retired from his company and practically dropped his electrical interests, and it was in that year that the honorary degree of Doctor of Engineering was conferred upon him by Carlsruhe University.

In Switzerland he helped largely to create a highly important industry to which his inventive work and the world-wide appreciation of it were a great stimulus. Amongst the novel constructions which Mr. Brown originated were oil-immersed transformers, the umbrella type of vertical shaft generator, the elegant construction for low-speed generators with the stator carried on radial arms as used for the Frankfort machines, the external-field type of flywheel generator, the special 15,000-volt generators for Paderno, the three-phase railway motor, and the cylindrical rotor now universally employed for turbo-alternators. He also exercised a powerful influence on the development of the induction motor, which, in its practical form, was largely the result of his own experiments and designs.

It would not be unfitting to describe Mr. Brown as an Anglo-Swiss Ferranti, for like the latter, he was exceedingly fertile of new ideas, and was no less skilful in converting them into concrete realities.

MR. A. WARREN.—We regret to read in a recent copy of the *Electrical World* that an electrical publicity man, formerly well-known on both sides of the Atlantic, passed away in April at Hamilton, Bermuda. Mr. Arthur Warren was associated with the late George Westinghouse and the Westinghouse interests both here and in America. He subsequently joined the Allis-Chalmers Company in America. He had a lengthy career as a newspaper man. He was 64 years of age.

MR. W. D. HUNTER.—We regret to record the death, which occurred on May 17th, of Mr. William Dods Hunter, M.I.E.E., of Newcastle-on-Tyne. Mr. Hunter had been associated with the Newcastle and District Electric Lighting Co., Ltd., since its inception in 1889. He was a native of Lauder, Berwickshire, and served his apprenticeship as an engineer with Messrs. Clarke, Chapman & Co., Gateshead. When the Lighting Co. was formed he joined it, and in 1902, when Sir Charles Parsons retired, Mr. Hunter was made managing director and engineer. That position he continued to hold until he retired in 1918. He remained on the board of directors and was consulting engineer until his death.

MR. J. WALKER.—The death occurred at Morecambe, on May 6th, at the age of 55 years, of Mr. John Walker, who was associated with the Northern Electrical Wire Co., of Halifax. He was also in business at Cleckheaton as a steel-wire manufacturer, and a director of George Crossley, Ltd., engineers, of the same town.

New Companies Registered.

Brijane, Ltd. (197,801).—Private company. Registered May 8th. Capital, £500 in £1 shares. To carry on the business of manufacturers of and dealers in all kinds of lamp shades, glass or other material, wireless sets, parts and accessories, electrical batteries, accumulators, dry and wet cells for bells and telephones, factors of motor and cycle accessories, ironmongery, hardware, &c. The permanent directors are:—R. J. Jacobs, Regent's Palace Hotel, W.; H. L. Bristow, 125, Turney Road, Dulwich, S.E.; J. C. Draghi, 382a, Merton Road, Southfields, S.W.18. Qualification: £50. Remuneration as fixed by the company. Registered office: 76, Newgate Street, E.C.1.

Porto Radio, Ltd. (197,851).—Private company. Registered May 10th. Capital, £1,250 in 1,000 10 per cent. cumulative preference shares of £1 and 5,000 ordinary shares of 1s. To take over from B. Morgan the benefit of certain inventions relating to portable wireless receiving sets. The subscribers (each with one ordinary share) are:—W. T. Pole, 61, St. James's Street, S.W.1, merchant; Mary A. Heyburn, 61, St. James's Street, S.W.1, secretary. The first directors are:—W. T. Pole, H. L. A. May and B. Morgan. Solicitors: Wordsworth, Marr Johnson & Shaw, 39, Lombard Street, E.C. Registered office: 61, St. James's Street, S.W.1.

C.A.T. Cable Co., Ltd. (197,844).—Private company. Registered May 10th. Capital, £1,000 in £1 shares. To carry on the business of designers, manufacturers, exporters and importers of, contractors and factors for and dealers in telegraphic, telephonic, electric and other cables, casings and wire, electrical apparatus, wireless sundries, &c. The subscribers (each with one share) are:—P. Adair, 7, Old Quebec Street, Marble Arch, W., electrical engineer; S. A. Edwards, 74, Third Avenue, Queen's Park, W.10, secretary. The first directors are:—P. Adair, A. Collins and R. B. Turner. Qualification: 1 share. Remuneration as fixed by the company. Registered office: 175, Piccadilly, W.

Barclays Radio Stores, Ltd. (197,883).—Private company. Registered May 13th. Capital, £500 in £1 shares. To carry on the business of retailers and factors of wireless telephony instruments and component parts thereof, &c. The subscribers (each with one share) are:—J. B. Russon, 30, Stephenson Street, Birmingham, merchant and manufacturer; Mrs. H. Russon, Edgbaston House, Gough Road, Edgbaston, Birmingham. The subscribers are to appoint the first directors. Qualification: 10 shares. Solicitors: Forsyth Bettinson & Co., 36, Cannon Street, Birmingham.

W. Robson & Sons, Ltd. (197,929).—Private company. Registered May 14th. Capital, £500 in £1 shares. To carry on the business of electrical, lighting, and mechanical engineers, gas engineers, boilermakers, toolmakers, ironfounders, ship builders and repairers, brassfounders, manufacturers and repairers of, and dealers in dynamos, motors, tools, implements and machinery of all kinds, electric hammers, automobiles, motor-cars, motor-cabs, motor-boats, &c. The permanent directors are:—T. W. Robson, 226, Westminster Road, Liverpool; Mrs. G. Robson, 226, Westminster Road, Liverpool. Qualification, 10 shares. Solicitor: G. Williams, 20, North John Street, Liverpool. Registered office: 226, Westminster Road, Liverpool.

Official Returns of Electrical Companies.

Patent Conveyor Co., Ltd.—Satisfaction in full on April 30th, 1924, of debenture dated October 1st, 1910, securing £800.

North Wales Power Co., Ltd.—Satisfaction in full on February 5th, 1924, of mortgage dated December 20th, 1923, securing £200. Satisfaction in full on May 19th, 1924, of mortgage dated March 9th, 1922, securing £16,500.

Simmonds & Stokes, Ltd.—Particulars filed of £1,000 second debentures authorised April 29th, 1924, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £200.

F. C. Brown (Electricity), Ltd.—First mortgage debenture dated May 3rd, 1924, to secure £500, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: F. C. Brown, 54, Kensington Road, Coventry.

Bridgwater and District Electric Supply and Traction Co., Ltd.—Particulars filed on May 7th, 1924, of £2,150 third debentures authorised December 29th, 1923, charged on the company's undertaking and property, present and future, including uncalled capital, subject to such as are outstanding of debentures previously issued, the whole amount being now issued.

Orford Electric Light and Power Co., Ltd.—Issue on May 5th, 1924, of £300 debentures, part of a series already registered.

Porter Turk & Son, Ltd.—Mortgage dated May 5th, 1924, to secure £1,400, charged on 118, Bartholomew Street, Newbury, Berks. Holders: Newbury Permanent Benefit Building Society.

Vickers, Ltd.—A trust deed dated April 1st, 1924, to secure £3,250,000 first mortgage debenture stock, and a premium of 3 per cent. on £2,000,000 thereof, charged on freehold and leasehold works of the company at Sheffield, Barrow-in-Furness (except the premises known as the Shell Shop, approximately 7 acres in extent, in the Shipyard), and at Erith and the company's undertaking and property, present and future, including uncalled capital, has been registered. The trustees are: Glyn, Mills, Currie, Holt and Co., 67, Lombard Street, E.C.

Hampshire Light Railways (Electric) Co., Ltd. (52,564c).—Return dated January 11th, 1924. Capital, £1,000 in £10 shares. All shares taken up. £1,000 paid. Mortgages and charges, nil.

W. E. Dove & Co., Ltd. (72,630).—Return dated March 10th, 1924. Capital, £3,500 in £10 shares. 320 shares taken up. £2,000 paid. £1,200 considered as paid. Mortgages and charges, £800.

Barbados Electric Supply Corporation, Ltd. (104,367).—Return dated December 28th, 1923. Capital, 60,000 in 40,000 preferred and participating and 20,000 ordinary shares of £1 each. 35,172 preferred and 20,000 ordinary shares taken up. £34,672 paid on 34,672 preferred shares. £20,500 considered as paid on 500 preferred and 20,000 ordinary shares. Mortgages and charges, £22,000.

City Notes.

Callender's Cable and Construction Co., Ltd.

The accounts for the year ended December 31st, 1923, show a balance to the credit of profit and loss account of £264,086. From this there are deducted: Interest on debenture stock, £13,500; dividend on 6½ per cent. preference shares, £26,000; dividend on 7½ per cent. preference shares, £30,000; depreciation of buildings, plant and machinery, £30,000; depreciation of office furniture, £500; leaving £164,086, to which is added £226,901 brought forward, leaving an available balance of £390,987. A dividend on the ordinary shares at the rate of 15 per cent. per annum, being 3s. per share, less income tax, requires £75,000, and there remains to be carried forward £315,987.

The directors report as follows:—"Relief having been obtained in respect of income tax charged in the Overseas Dominions, this will be passed on to the shareholders by an adjustment of the British income tax on the warrants for the final dividend. The amount of the tax will be 4s. 4d. instead of 4s. 7½d. in the £. A large business has been done during 1923, the turnover having considerably exceeded that of any previous year. Competition has again been keen, resulting in a diminished ratio of profit. This applies not only to the ordinary home trade but to overseas contracts, and your directors therefore consider that the results shown are satisfactory, as, after meeting all charges, a record profit is available. The factories of the company have been well employed during the year, and so continue at the present time. The cost of production has again been lessened owing to the steady flow of orders and to the new plant, machinery, and methods introduced during the last few years. Considerable progress has been made in interlinking existing central supply stations, although no general plan for carrying this out on any extensive scale has yet been put into practice. The experience of those supply undertakings who have adopted interconnection will undoubtedly lead to an extended use of super-tension cables, and the expectation of your directors in regard thereto is being fully justified. There has been considerable extension in the overseas business of the company from most of the offices and centres already established. The new branch recently inaugurated in China is making steady and satisfactory headway. The conditions which still prevail on the Continent, especially in regard to exchange, render it extremely difficult to carry on trade in those countries in which the company previously had many and friendly connections. Your directors note with pleasure that considerable improvement has taken place in the trade in rubber wires and cables in which your Anchor Company specialises. The labour conditions both at Erith and at Leigh are, happily, satisfactory. An increase in the rate of wages has recently been arrived at by friendly conference, and the relations between the workpeople and the management continue excellent. The plant and machinery have, as usual, been kept in a thorough state of efficiency, and the cost thereof has been debited as a working charge on the year's accounts."

Mr. John Varley, who for many years was a member of the board, resigned early last year owing to ill-health. Sir Malcolm Fraser, Bart., G.B.E., and Sir Ernest Moir, Bart., M.Inst.C.E., have joined the board. Meeting: London, yesterday, May 22nd.

Urban Electric Supply Co., Ltd.

Mr. P. D. Tuckett presided at the annual meeting held at Winchester House on May 14th. In moving the adoption of the report (see our issue of May 9th, p. 763), the chairman said that the income from the undertakings showed an apparent reduction of £1,695 owing to their loss of the Newton Abbot station, which contributed £7,193 to last year's total, so that there was in fact an increase of £5,498. The balance from contracting work was £464 less owing to the keener competition which they had had to meet. The comparatively large increase of over £2,200 in interest from investments simply reflected the stronger cash position resulting from last year's debenture issue. The results realised were as good as they expected, or as the shareholders were led to expect a year ago. During the past year they had had to work hard to earn the dividend, and this year, with coal very substantially up in price and with labour claiming increased wages, they would have to work hard to maintain it. Turning to the balance sheet, the chairman said that the capital expenditure on the undertakings showed a reduction of £78,516, owing chiefly to the sale of the Newton Abbot undertaking, and to writing off plant dismantled at Weybridge and Carn Brea, where they were taking a.c. bulk supplies. The advances to the Camborne and other companies were reduced by £42,550, chiefly in consequence of repayments, but £9,395 owing by the Penzance company had been converted into shares of that company and added to the investments.

Their cash and liquid resources were increased by over £100,000, and stood at £110,737. The preference share capital was increased by the £100,000 which Edmundson's took up last year in part satisfaction of their advance, which now disappeared. The outstanding first debenture stock was reduced by £52,868, mainly as a result of the sale of the Newton Abbot undertaking, whilst £350,000 5½ per cent. debenture stock appeared for the first time. The reserve for depreciation was about £2,000 larger, the debenture redemption reserve was up £19,452, and the capital reserve was reduced by £20,576. The general reserve was increased by the £5,000 which was added to it last year. In the aggregate the reserves showed an increase of £5,784 only, but the loss on the sale of the Newton Abbot undertaking and the discount on debenture stocks were exceptional items. The most important developments of the past year had been the 5½ per cent. debenture stock issue, the carrying through of the other changes embodied in the scheme which was put before them a year ago, the sale of their Newton Abbot undertaking, the shutting down of Weybridge and Carn Brea as independent generating stations, and the changing over of several parts of the Twickenham company's area from direct to alternating current supply. These changes were calculated to exert a beneficial influence on the business, and would in due course undoubtedly do so by cheapening the cost of supply, but their most marked immediate effect was to burden them with additional expense incidental to the cost of the change over. The general progress of the business had been much more normal than for many years past, their revenue showing a moderate increase and their costs no marked change with coal at a slightly higher price, and with various special charges incidental to the change of system at Weybridge and Carn Brea. They made a net addition to their connected load of 513 kW only, owing to the disconnection of a war-time load of 1,633 kW, but inasmuch as they had derived no revenue from that connection for some years, its loss was of no real moment; the lighting connections showed a 72 per cent. increase over those for 1922. In Hawick, Stamford, Godalming, and Berwick, where they had considerable power loads, their undertakings were affected by the prevailing trade depression and sold

115,000 kWh less than in 1922. The other undertakings, apart from the Cornwall Power Co., sold 1,100,000 kWh more, whilst the company named sold over 5,000,000 kWh more. For the current year the general outlook was somewhat uncertain, with the uncertain influence of politics on business, coal costing more, and with labour demanding a further increase of wages, but, apart from those factors, they had no doubt as to the stability and steady progress of the business, based as it was on an increasing public appreciation of the value of electricity. Mr. H. T. Crosthwaite seconded the motion, which was adopted.

Johnson and Phillips, Ltd.

The annual meeting was held on May 15th. Mr. W. Claud Johnson, the chairman, presided, and in moving the adoption of the report (*vide* Electrical Review, May 9th, p. 763), said that the profit was nearly £7,000 better than that of the previous year. Turning to the balance sheet, he said that the item of sundry creditors and reserve for contingencies stood at £140,902, against £77,515 in the previous year. That was entirely due to the very large increase in the value of orders in hand at the end of the year. On the other side of the account, sundry debtors at £218,712 also showed an increase of some £70,000 compared with the previous year. Stock in trade and work in progress also showed an increase of, roughly, £35,000, which represented expenditure on the large amount of orders in hand at the end of the year. They had spent £45,000 on additions to plant and machinery, &c.; this was necessary in order to cope with the ever-increasing amount of work which was now being secured. Last year he ventured to suggest that there were indications of a steady improvement in trade generally. Although perhaps the trade revival had been somewhat slower in making itself felt than they anticipated, only becoming appreciable during the latter half of the year under review, it was nevertheless a fact that in their particular case, at least, they had more work in hand at the moment than at any time in the history of the company. Their policy was to turn out the best work only, and if they had good management, good raw materials, up-to-date plant and keen loyal workmen, it cost little more to produce the best article than an inferior one. This policy could always be relied upon to bring in repeat orders, which must necessarily constitute the mainstay of a business like theirs. Their relations with their workmen and staff had been excellent, and they were much indebted to them for their efforts during the year under review. Among some of the more important orders recently obtained outside the Government Departments, he might mention the contracts for cable work which they had in hand for the Southern Railway, both for the South-Eastern and the Brighton sections. The order placed with them by the Southern Railway for the South-Eastern section was probably the largest cable order of its kind ever placed in this country. The directors considered the result of the year's work under review highly satisfactory, in view of the difficult times through which they had been passing, and he was happy to be able to report that with the order books so full as they were at present, they could confidently look forward to still better results in the future. During the last few months they had been carrying out a very large amount of electrical work at the British Empire Exhibition at Wembley, and in view of the importance of the exhibition they very early decided that it was necessary for them to have a stand there in the Palace of Engineering. It was confidently anticipated that the results of the Exhibition would add considerably to the order books at the works in the future, with consequent benefit to the shareholders. Mr. John Macgregor, the managing director, in seconding the motion, said that although the profit for the past year was not much larger than that of the previous year, it must still be considered satisfactory when all the circumstances were taken into consideration. In many directions the competition in their trade had been very keen. Owing to want of trade the hope he expressed last year of the expansion of the business of the country had not been quite fulfilled. The strikes and threatened strikes had caused a want of confidence which had put a brake on the extension of industrial undertakings and business generally. To-day the position was brighter, and they could anticipate a greater success for the current year. The first four months of this year had shown a great improvement, which they hoped and expected would be continued. Their business in e.h.p. cables continued to increase. Their strong financial position had enabled them to erect and house the additional plant required to deal with new business and provide the necessary material and labour for the increased number of orders. The report was adopted unanimously.

Electric Supply Corporation, Ltd.

The annual meeting was held on May 12th, at Winchester House, E.C., Mr. J. G. B. Stone presiding. The Chairman said that during the year the directors decided that it would be a benefit to the company to take advantage of the favourable money market and make an issue of preference shares for the purpose of redeeming the debenture issue. As the result of that operation the balance sheet was free from any debenture debt. The company was in the strong position of having large borrowing powers which could be used should the necessity arise at any future time. The gross earnings had been increased by 11¼ per cent. That was due to the sale of 7,402,218 kWh against 6,187,274 kWh sold in the previous year, an increase of 20 per cent. The bulk of that increase was due to improved trade conditions in Dumbarton. The profit, including dividends on investments, amounted to £38,879, against £29,563 in 1922. Lamp connections showed an increase, the equivalent of 21,474 lamps during the year, being about 5¼ per cent. The percentage was a low one, but in many of their towns the rate of increase was much greater than the average. On July 5th, 1923, the company obtained the Exmouth Electricity Special Order, 1923, which in effect transferred the Order of 1900 from the Urban District Council of Exmouth to the company. Under that Special Order the company obtained powers to increase its rates, and that had been brought into effect as from October 1st, 1923. In the case of the Hitchin undertaking, a Special Order had been applied for, which would have the same effect as that of the Exmouth Order. They had experienced great delay and procrastination, but he was pleased to report now that it had been finally approved by the Ministry of Transport and only awaited the confirmation of Parliament. Turning to the accounts, the capital account showed an increased expenditure of £15,676, chiefly on mains, but they were now beginning to spend money on additions to their generating plant. So far the work had started in Exmouth, Falmouth, and St. Andrews, but other towns would require further plant to meet the increased load, unless they were able to arrange for a bulk supply, a matter which they had constantly before them. The improved revenue result was largely due to the fact that though the revenue had increased, the working expenses showed a reduction of some £450. Interest on investments showed a slight reduction from £6,383 to £6,090. Sundry creditors and credit balances stood at the abnormally high figure of £47,278. That included £19,063 due to holders of debenture stock who had not come forward for repayment and since the accounts were closed that item had been reduced to £2,460. Their repairs and renewals fund remained at the old figure of £10,000. The new depreciation fund, which stood at £10,000, would be increased to £20,000, and there would be the nucleus of a general reserve fund brought up to £5,000. Mr. K. A. Scott-Moncrieff seconded the motion, and the report was adopted.

Calcutta Electric Supply Corporation, Ltd.

The directors report that during the year 1923 66,444,423 kWh were sold, compared with 51,598,579 kWh in 1922. The number of houses connected increased to 14,522, an advance of 1,640. The comparative results are:—

	1922.	1923.
Houses connected	12,882	14,522
KWh sold	51,598,579	66,444,423
Gross revenue, excluding interest investments	£514,935	£605,744
Net revenue, excluding profit on exchange	£281,414	£322,659

The demand for electrical energy in Calcutta continued to be satisfactory: and substantial progress was made with the installation of plant ordered in previous years. No further capital was raised; but the balance, £300,000, of the loan guaranteed by H.M. Treasury was received during the year. The profits for the year 1923 amount to £329,831, plus £34,439 brought forward, making £364,270. Out of this a full and adequate provision has been made for depreciation and renewals, there being put to depreciation and renewals fund £83,877; debenture interest (first mortgage) required £36,092; debenture interest (second mortgage), £19,310; preference dividend, £41,895; interim dividend of 4 per cent. (actual) on ordinary shares paid in November, 1923, £32,223; interest on consumers' deposits, £2,806; sinking fund on first mortgage debentures, £19,307; reserve for taxation, £19,456; loss on sale of investments, £1,913. The balance of £107,391 is to be dealt with as follows: To reserve fund, £15,000; to insurance fund, £2,000; to retiring gratuity fund, £1,000; final dividend on ordinary shares at 6 per cent. (actual), making 10 per cent. for the year, and in addition a bonus of 1 per cent., £57,486, leaving a carry forward of £31,905.

The ordinary shareholders continue to receive the benefit of the relief afforded in previous years in respect of income tax and super tax paid in India. The preference dividend is paid free of taxation on income, both British and Indian, up to 6s. in the £. The first mortgage debenture interest is income tax free. It is proposed to grant to the staff in India a bonus equivalent to 2 per cent. of the net Indian profit, in respect of approved service actually rendered in the year 1923. Meeting: London, May 19th.

Craigpark Electric Cable Co., Ltd.

Mr. R. Scott presided at the annual meeting held in Glasgow last week. After referring to the absence of Dr. Magnus Maclean, the chairman, and Mr. Peter Rintoul, both of whom were in other lands in search of sunshine and health, he said that though there had been an increase in trade during the year, a considerable portion of it was at low prices, but by accepting these orders more regular employment had been given to their workers. The net profits, after allowing for corporation profits tax, showed a small decrease compared with the previous year, which was quite satisfactory considering all the circumstances affecting trade throughout the year. The company's financial position was very sound, the net liquid assets alone at March 31st, 1924, equalling nearly half the total of the issued share capital. The directors proposed writing off £2,000 for

depreciation on buildings and machinery. The reserve account, which now stood at the satisfactory figure of £27,000, they did not propose to add to this year, preferring, in view of the somewhat better prospects for the coming year, to pay the 12½ per cent. dividend on the ordinary shares as before, leaving £1,907 to be carried forward, subject to directors' fees.

British Thomson-Houston Co., Ltd.

The directors' report for the year 1923 states that the buildings and machinery at all the works of the company were maintained in good condition throughout the year. The expenditure for additions amounted to £227,000. During the year the company acquired further works at Coventry. As business expands it is the policy of the company to meet the demands upon it by acquiring additional factories and equipment as rapidly as possible. The profits for the year, after deducting all expenses and charges other than interest on debentures and loans, were £451,778. Adding £236,671 brought forward, and deducting interest on debentures and loans £119,286, the amount remaining is £569,163. Of this amount the directors recommend that there be appropriated for depreciation, &c., £185,440. Dividends paid on preference shares at the rate of 7 per cent. per annum, less income tax, absorb £80,000, and the directors recommend the payment of a dividend on the ordinary shares at the rate of 6 per cent. per annum, less income tax, £92,250, and to carry to new account £210,863. Redemption of 4½ per cent. and 7 per cent. debentures has been duly effected up to the amounts required under the respective trust deeds. The proper proportion of discount, commission, &c., on the issue of 7 per cent. mortgage debenture stock was written off during the year. The cost of converting preference shares was reduced by over £24,000 during the year, and it is anticipated that the balance will be written off by the end of 1925. The profits for 1922 were £494,592, compared with £509,259 for 1921. The dividend for 1922 was 6 per cent., free of tax, as compared with 6 per cent., less tax, now, and the carry forward is less this year by £25,808. Meeting: London, June 4th.

Sir W. G. Armstrong Whitworth & Co., Ltd.

The profit for 1923, after charging £219,275 for debenture interest, is £436,377, compared with £467,550 for 1922. The dispute with the boilermakers, which lasted till the end of November, seriously affected the profits, not only by reducing the output of work, but also by leaving a larger part of the standing charges to be borne by other orders. A final dividend on the ordinary shares of 6d. per share, makes 1s., or 5 per cent., less tax, for the year (as for 1922), carrying forward £679,768. There is an increased amount of work in most of the departments, and this has resulted in the employment of a larger number of men, but prices are still very low, and it is becoming more and more difficult to secure new work with any margin of profit. On the other hand, the civil engineering department has obtained satisfactory contracts in different parts of the world, and the prospects of some of the allied companies are more encouraging.

Lancashire Electric Light and Power Co., Ltd.

The trading profit of the "Parliamentary" company (the Lancashire Electric Power Co.) for the year 1923 was £157,943. To this was added £5,107 brought forward, making £163,050. After transferring £50,000 to depreciation account, £7,031 to income tax reserve, and carrying £6,047 forward, the balance of £99,971 has been paid to the limited company. The latter, after paying debenture interest, &c., has a balance of £67,427, to which is added £5,997 brought forward, making £73,424. After the payment of the first preference dividend and 7½ per cent. on the 7 per cent. cumulative participating preference shares, the ordinary shares receive 7½ per cent., £10,000 is transferred to reserve, and a balance of £7,661 carried forward. The debenture capital was redeemed during the year out of the proceeds of an issue of 350,000 £1 7 per cent. cumulative participating preference shares, and 350,000 ordinary shares. The returns of the Parliamentary company show an increase in the amount of energy generated or purchased from 90,434,835 to 105,254,140 kWh. The connected load rose from 63,000 to 68,630 h.p., and the maximum load from 45,850 to 49,650 h.p. Meeting: May 29th.

Calcutta Tramways Co., Ltd.

The accounts for 1923 (on the basis 1 rupee=1s. 4d.) show a net revenue of £170,015, and to this is added £1,327 brought forward, making £171,342. After the payment of dividends on the preference shares, and an interim dividend on the ordinary shares, there remains a balance of £108,390, which it is proposed to allocate as follows: To reserve for depreciation £50,000, to general reserve £11,000, to suspense account £5,000, staff provident fund £1,937, and a dividend of 5 per cent. (making 7½ per cent. for the year), free of tax, £35,000, leaving £5,452 to be carried forward. The receipts showed an increase of about 8 per cent., in spite of a month's strike, and the expenditure in India decreased by about 7 per cent. The additional rolling stock, comprising 25 new trains, has been put into service, and the Kidderpore Bridge has been rebuilt. The company is represented upon the committee appointed to inquire into the traffic conditions in Calcutta; the recommendations of this committee will, it is hoped, be published before the end of the current year. The meeting is to be held on May 27th.

Stock Exchange Notices.—Application has been made to the Committee to allow the following to be officially quoted:—

Vickers, Ltd.—£1,250,000 5 per cent. first mortgage debenture stock.

Dealings in the following have been specially allowed by the Committee under Rule 159.

Electrolytic Zinc Company of Australasia.—350,000 ordinary shares of £1 each, fully paid (Nos. 1,150,001 to 1,500,000) (deferred as to dividend until July 31st, 1925), and 400,000 cumulative participating preference shares of £1 each, fully paid (Nos. 2,600,001 to 3,000,000).

Newcastle and District Electric Lighting Company.—300,000 ordinary shares of £1 each, fully paid (Nos. 1 to 300,000).

North Wales Power Co.—£1,500,000 4½ per cent. guaranteed debenture stock, 1930-53, issued at 95½ per cent., partly and fully paid.

The undermentioned have been ordered to be officially quoted:—

Newcastle and District Electric Lighting Co.—300,000 shares of £1 each, fully paid (Nos. 1 to 300,000).

Anchor Cable Co., Ltd.—The profit made during the year ended December 31st, 1923, was £18,420. After deducting debenture interest £2,500 and adding £95,963 brought forward, the available balance is £112,133. The total dividend is to be 20 per cent. less tax, for the year, absorbing £13,000 and leaving £99,133 to be carried forward. The sales during the year have improved, and this improvement is reflected in the increase in the profits. The directors have not considered it necessary to set aside any further sum for depreciation this year, as the figure at which the property of the company stands in its books is an extremely conservative one.

Siemens Bros. & Co., Ltd.—The annual report, which appears at the moment of going to press, shows a profit of £162,229. It is stated that the results of trading for the current year up to date are satisfactory, and if continued, as seems probable, the directors will be in a position to declare an interim dividend on the ordinary shares for the current half-year.

Chloride Electrical Storage Co., Ltd.—The Manchester dispatches quoted from on page 763 of our issue of May 9th were incorrect. The final dividend of 5 per cent. made the dividend 10 per cent., while the bonus of 2s. per share equals 10 per cent., making 20 per cent. in all, not 30 per cent. as stated.

Brisbane Electric Tramways Investment Co., Ltd.—According to the daily Press, terms have been arranged between representatives of the Brisbane Municipal Tramway Trust and the board of the Brisbane Tramways Co., which, it is expected, will enable the directors ultimately to repay the shares at par.

Submarine Cables Trust, Ltd.—The accounts for the year show revenue £30,479, and expenses £1,738, leaving £28,741. After providing £5,610 to meet payment of coupons, £23,158 has been transferred to redemption fund. £28 is carried forward.

British Electric Traction Co., Ltd.—Final dividend of 4 per cent. on the ordinary stock for the year ended March 31st, 1924, making 6 per cent. for the year, compared with 5 per cent. for the previous year.

Barnsley and District Electric Traction Co., Ltd.—After placing £10,000 to reserve the directors recommend a dividend of 15 per cent., free of tax, for the year, carrying forward £20,571.

Vickers, Ltd.—There is to be no dividend on the ordinary shares for the year 1923. For the years 1921 and 1922 the rate paid was 5 per cent., less tax.

Merthyr Electric Traction and Lighting Co., Ltd.—After paying 7½ per cent. on the ordinary shares for the year, and putting £2,000 to reserve, £4,292 is being carried forward.

Commonwealth Edison Co.—A dividend of $2 per share for the quarter is announced.

Tramways and Light Railways Estates, Ltd.—Dividend of 3 per cent. for 1923, carrying forward £234.

Stocks and Shares.

MONDAY EVENING.

A FAIR amount of support has been accorded to Stock Exchange markets by the public, though the business is almost entirely of the investment order, speculation being extremely dormant. People seem to be rather afraid of the outlook as it concerns the industrial world, though no particular reason is given for the vague apprehension which exists. There is no doubt that the Continental confusion, more especially the uncertainty prevailing in France, serves to impose a check upon financial conditions on this side, and to cause the public to refrain from that speculation which is declared, and rightly, to be the life-blood of Stock Exchange markets. During the past few days, alarmist rumours became circulated with reference to the internal condition of Mexico. Although these were followed by a statement to the effect that they were regarded in New York as being of no consequence, Mexican securities have been

unfavourably affected in price. The Utilities are, however, unchanged; Mexican Light and Power preference is, indeed, a point to the good at 47½.

British Electric Traction has risen another 3 points, the stock now standing at 84. The advance is due to the declaration of a final dividend, making 6 per cent. for the year, as against 5 per cent. in 1923 and 4½ per cent. in 1922. The company is doing well, as the report shows, and the present price of the stock is justified from the point of view of the outlook. In other traction stocks, Metropolitan Consolidated again leads the way, the price at 82 being 30s. higher on the week. Curiosity asks what price Metropolitans are likely to touch. On merits, the stock looks, of course, too high at anything like the present figure, though if the dividend were to be increased to 5 per cent., this, with the prospects of the line being taken over by one of the bigger brethren, would be held to justify the figure. Districts remain at 53, and in the Underground issues, there is no feature. The Income bonds remain heavy at 95, and the explanation of this weakness is attributed in the Stock Exchange to reconsideration of Lord Ashfield's statement, made during the 'bus strike, with regard to the poor earnings of the Underground companies. It is pointed out that, although the circumstances of the case would naturally tend to give Lord Ashfield's statement a measure of special pleading, yet in the past he has dealt candidly with his shareholders, and laid before them the true facts of the situation as these stood from time to time.

Electricity supply shares are very quiet. Chelseas and County ordinary are both 1/16 better, the only alterations in the list. It is beginning to become apparent what the terms are likely to be of the agreement sought to be embodied in Parliamentary Bills by the companies and the various authorities concerned. The impression is that the companies are likely to distribute their reserve funds and to pay 7 per cent. dividends on these, while maintaining, for a few years' time, the dividends (on their share capital) paid in 1922. At the end of the short period fixed for this dividend distribution, the shares involved in the capital and reserve funds would be fused and the lower rate of dividend declared thereafter on the whole lot. The Stock Exchange market made a rough calculation a month or six weeks ago, using this basis for its calculation, and, so far as could be seen from the way in which the figures worked out, the current prices, which were not very different then from those of to-day, seemed to be reasonably valued in respect of the yield which they offered to a purchaser of sound industrial shares distributions upon which were not likely to be liable to much variation. It may be added that the companies will be able to pay what they like for the current year.

General Electric Ordinary fell back to 19s. 3d., on sales by those who estimate that, if the company's dividend is maintained at 5 per cent., the present price will not look particularly cheap. Siemens also lost 1s. 3d., with a fall to 18s. 3d., although the dividend in their case is expected to be nearer 10 per cent. Callenders are 2s. 6d. up at 51s. 3d. The company is repeating its previous 15 per cent. dividend for the year, but the report shows a record profit of £264,000. The strength of the ordinary has brought into prominence the attraction of the company's 7½ per cent. "B" preference, of which there were a few thousand on offer at 25s. 6d. Attention being called to them, however, they were nearly all snapped up. If shares can be bought at this figure or less, the purchase is a good one, because the yield on the money comes to 6 per cent. allowing for the accrued dividend, while the security for the shares is first rate.

Babcock & Wilcox rose to 2 7/16. Iron and steel shares are weak, generally speaking, in consequence of Vickers passing its dividend for 1923. Vickers shares fell to 9s. 6d., recovering a shade on bear repurchases.

Cable stocks are good, with rises in Eastern Extensions, Globe preference and Western ordinary. Anglo-American preferred at 104 is 1 up. Anglo-American deferred hardened to 23¼. Cuba Submarines are higher at 7. Great Northern Telegraphs rose 15s. to 29½. The only weak spot in the list is that for Marconi shares. The ordinary have fallen to 30s., at which the return on the money, assuming maintenance of the 15 per cent. dividend, would be 10 per cent. Henley's improved to 50s. 9d. in sympathy with Callenders. British Aluminium at 25s. are 1s. 9d. better. India Rubber shares seem unable to get away from 13s. 9d. Their turn, however, may not be far off.

London and Suburban Traction preference are 1s. higher at 6s. 6d., yet the 4½ per cent. debenture stock at 55 is down 3 points. London United Tramways preference hardened to 3s. Brisbane Electric preference put on 25s. and the ordinary about the same, on the official announcement that it is possible that the shares may be paid off at par, *i.e.*, £5. Adelaide Electric Supply preference are better at 20s. 6d. Holders of this company's 5 per cent. debenture stock are being given the chance to exchange their interest into a 5 per cent. stock, £1 for £1. The intention is, apparently, to get rid of the first charge which the 5 per cent. stock now carries, as there is but the small amount of £124,000 now outstanding.

Rubber shares are flat, the price of the produce having fallen to a level lower than has been touched for nearly two years.

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom. £	Dividend. 1922.	Dividend. 1923.	Price May 19, 1924.	Rise or fall.	Yield. p.c.
Brompton Ordinary	1	12	10	37/-	—	*25 8 1
Charing Cross Ordinary	1	14	14½	42/6	—	6 16 6
do. do. do. 4½ Pref.	1	4½	4½	17/-	—	5 6 0
Chelsea	1	10	12	36/3	+ 1/16	6 12 7
City of London	1	15	15	45/9	—	6 11 0
do. do. 6 % Pref. ...	1	6	6	23/6	—	5 2 2
County of London	1	10	15	47/-	+ 1/16	6 7 9
do. do. 6 % Pref. ...	1	6	6	1¼	—	5 6 8
Edmundson's Ordinary	2	7	7	5	—	4 4 1
do. 6 % Pref.	5	6	6	5¼	—	5 17 1
Kensington Ordinary	5	12	14	10	—	7 0 0
London Electric	1	10	10	31/-	—	6 9 0
do. do. 6 % Pref. ...	5	6	6	5⅛	—	5 11 7
Metropolitan	1	8½	10	1⅞	—	5 14 3
do. 4½ % Pref.	1	4½	4½	17/-	—	5 6 0
Newcastle-on-Tyne Ordinary ...	1	2½	6	18/9	—	6 8 1
do. 5 % Pref. ...	1	5	5	17/3	—	5 16 0
do. 7 % Pref. ...	1	7	7	24/-	—	5 16 8
Notting Hill 6 % Pref.	10	6	6	9¼	—	6 6 4
North Met. Elec. 6 % Pref. ...	1	6	6	21/3	—	5 13 0
Urban Ordinary	1	—	4	18/3	—	4 7 8
do 6 % Pref. ...	1	5	6	1	—	6 0 0
St. James' and Pall Mall ...	5	14½	17½	13¼	—	6 13 4
South London	1	11	15	42/-	—	6 7 2
South Metropolitan Pref. ...	1	7	7	1¼	—	5 12 0
Westminster Ordinary	5	12	15	10⅜	—	7 1 2
Whitehall Elec. Invst. 7½ % Pref.	1	7½	7½	20/6	—	7 6 4

HOME RAILS.

Central London Ord. Assented Stock	4	4	68½	—	5 16 10
Metropolitan ... ... ,,	3½	4	82	+1½	4 17 6
do. District ... ... ,,	3	3½	53	—	6 12 1
Underground Electric Ordinary	10	Nil	Nil	2¾	—	Nil
do. do. "A" ...	1	Nil	Nil	8/-	—	Nil
do. do. Income Bonds	5	6	95	—	*6 6 4

TELEGRAPHS AND TELEPHONES.

		Dividend. 1921	Dividend. 1923			
Anglo-Am. Tel. Pref.	Stock	6	6	104	+1	5 15 6
do. Def.	,,	1½	34/6	23½	+ ⅛	6 7 8
Chile Telephone	5	6	6	6	—	5 0 0
Cuba Sub. Ord.	10	7	7	7	+ ½	10 0 0
Eastern Extension...	10	10	10	17⅜	+ ¼	5 15 1
Eastern Tel. Ord.	Stock	10	10	174½	+1	5 14 7
Globe Tel. and T. Ord.	10	10	10	18	—	5 11 1
do. do. Pref.	10	6	6	11⅛	+ ½	5 7 10
Great Northern Tel.	10	24	22	29½	+ ¾	7 8 0
Indo-European	25	10	7	33½xd	—	*5 6 1
Marconi	1	25	15	1½	+ 1/16	10 0 0
Oriental Telephone Ord.... ...	1	12	12	1⅜	—	*6 8 0
United R. Plate Tel.	5	8	8	7	—	*5 14 6
West India & Panama	10	Nil	Nil	1/-	—	Nil
Western Telegraph	10	10	10	17½	+ ½	5 15 0

HOME AND FOREIGN TRAMS, &C.

Anglo-Arg. Trams First Pref....	5	5½	12½	8½	—	8 9 0
do. do. 2nd Pref. ...	5	Nil	5½	2⅛	—	10 4 4
do. do. 5% Deb. ...	Stock	5	5	73½	—	6 16 3
British Electric Traction Ord. ...	,,	4½	5	84	+3	7 2 10
do. do. 6% Pref. ...	,,	6	6	99½	—	6 0 6
Brazil Traction	100	Nil	4	56½	+1½	7 1 8
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	85½	+1	5 17 0
do. do. Preferred	,,	5	96/-	85½	+1	*5 13 0
do. do. Deferred	,,	8	127/-	104	+1	*6 3 9
do. do. Deb.	,,	4½	4½	78½	—	5 8 3
Lond. & Sub. Trac. 5 % Pref. ...	1	8½	5	6/6	+1/-	7 13 10
London United Tram. Deb. ...	Stock	4	4	47	—	8 10 2
Mexico Trams. 5% Bonds ...	—	Nil	Nil	73½	—	6 16 0
do 6% Bonds ...	—	Nil	Nil	50½	—	Nil
Mexican Light Common ...	100	Nil	Nil	22½	—	Nil
do. Pref.	100	Nil	Nil	47½	+1	Nil
do. 1st Bonds ...	—	Nil	5	62½	—	7 6 0

MANUFACTURING COMPANIES.

Babcock & Wilcox...	1	15	20	2⅞	+ 1/16	*4 18 4
British Aluminium Ord.... ...	1	10	5	25/-	+1/9	4 0 0
British Insulated Ord.	1	15	15	50/6	+6d.	5 19 0
Callenders	1	15	15	51/3	+ ⅛	5 17 0
do. 6½ Pref....	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	10	5	⅝	—	8 17 10
Edison-Swan	4/-	Nil	7½	8/-	—	6 0 0
do. ,, 5% Deb.	Stock	5	5	78½	—	6 7 5
Electric Construction	1	10	10	1⅞	—	6 7 6
English Electric	1	8	5	16/9xd	—	5 19 3
do. do. Pref.	1	6	5	19/-	—	6 6 4
Gen. Elec. Pref.	1	6½	6½	23/-	-6d.	5 13 1
do. Ord.	1	10	5	19/3	— 1/16	5 4 0
Henley	1	15	15	50/9	+ 1/16	5 18 1
do. 4½ Pref.	5	4½	4½	4⅛	—	5 9 1
India-Rubber	1	10	10	1¼	—	*7 5 6
Met.-Vickers Pref....	2	8	8	2⅛	—	6 11 2
Siemens Ord.	1	10	10	18/3	—1/3	Nil
Telegraph Con.	12	20	20	24	—	*5 0 0

* Dividends paid free of Income Tax.

The Royal Society's Soirée.

Annual Exhibition and Demonstrations.

THE annual conversazione of the Royal Society was held at Burlington House on the evening of May 14th, Fellows and guests being welcomed by Sir Charles Sherrington, K.B.E., M.D., president. The customary exhibits and demonstrations of scientific apparatus arranged for the edification of the visitors numbered in all 44, of which about a quarter were of electrical interest. While, therefore, the attendance seems to be as large as ever, the number of exhibits appears to be growing smaller, neither has anything of a sensational nature been shown for the last two or three years.

Amongst the exhibits the crystalline structure of metal foils shown by Sir William Bragg, K.B.E., F.R.S., was examined with interest.

The Rev. A. L. Cortie, S.J. (Stonyhurst College Observatory), illustrated the relation between solar activity and terrestrial magnetic disturbance with the aid of sun-spot photographs and records of magnetic storms and earth currents.

Mr. F. Hope-Jones had a free pendulum astronomical regulator on view. The pendulum has nothing to do but swing, it having no escapement, and the only "interference" is that inevitable in giving the impulse which, in this case, is derived from the fall of a gravity lever every half minute; it is therefore uniform in quantity and is imparted mainly at zero. The duties of time counting and releasing the gravity arm are performed by a "slave" clock so firmly held in synchronism with the master, or free, pendulum that the phase difference can, it is claimed, never exceed 1/240th of a second. The "hit-and-miss" synchroniser is the invention of Mr. W. H. Shortt, M.Inst.C.E., in combination with the Synchronome system.

Prof. J. T. MacGregor-Morris and Mr. L. E. Ryall exhibited simple apparatus for the measurement of peak voltage, which makes use of the fact that an ordinary neon lamp strikes at a definite voltage, provided the frequency of the source of supply is above seven cycles per second. They use a variable condenser in parallel with a neon lamp and in series with a fixed condenser. This system is connected across the alternating supply, and the capacity of the variable condenser is gradually reduced until the neon lamp strikes. From a knowledge of the two capacities in series and the striking voltage of the lamp, the overall maximum voltage is readily obtainable.

The International Western Electric Co.'s interesting method of producing an even time scale for the inspection of wave-forms with the aid of a cathode ray oscillograph was demonstrated. The vertical line produced on the oscillograph screen by the alternating potential whose wave is to be examined, is spread out horizontally by impulses of a periodic linear character produced from a circuit in which a neon lamp is arranged to "blink." The impulses from the lamp circuit may be simply synchronised with the frequency of the supply under examination, so that a stationary representation of the wave is obtained. The method is suitable for waves of frequency 1 to 25,000 p.p.s, and may be used up to 50,000 p.p.s.

The National Physical Laboratory had three separate exhibits. The first (Mr. Bloxam and Mr. Buckley) was a machine for electrically hardening the ends of standard gauges, which minimises the possibility of the production of gauges having unequal coefficients of thermal expansion. If the hardening process be confined to a thin layer at the end of the gauge, the uncertainty produced by hardening may be reduced approximately in the ratio of the depths of the hardened layers to the length of the gauge. The electrical method confines the hardening to a layer of about $\frac{1}{4}$ in. in depth at each end of the gauge, it being produced by making the gauge one electrode in a circuit which includes three graphite resistors. When traversed by an a.c. of about 750 amperes the contact resistance at the two surfaces of the central graphite resistor produces a considerable heating effect, and a high temperature in the central graphite, the heat being conducted to the end of the gauge, which is thus heated slightly above the critical temperature. The breaking of the electrical circuit is then made to drop the gauge into cold water, where the rapid cooling of the end of the gauge results in its hardening to a depth determined by the distance the heat has penetrated the gauge. Contact resistance between the end of the gauge and the lower graphite resistor is eliminated by placing between them a thin sheet of a metal of low melting point; this melts early in the procedure and gives good electrical contact. With circular gauges of 1-in. diameter, 750 amperes for about two minutes hardens about $\frac{1}{4}$ in. of the gauge.

The second exhibit was an instrument (Mr. Taylor) which does not require an artificial illuminant, for quickly and conveniently measuring the natural lighting in rooms, and the third was an annular-jet mercury-vapour vacuum pump (Dr. Kaye and Mr. Backhurst) constructed wholly of metal. It represents an attempt to combine the advantages of the jet and condensation principles in a single and readily accessible unit, is free from welded joints, and will readily produce a vacuum of the order of 0.00001 mm. of mercury, or less, when working against a back pressure of 1 mm. of mercury. The annular jet has an area of nearly 3 sq. cm., and the speed of pumping varies between 1,000 and 7,000 cc. per second, depending on the pressure conditions. The pump was shown in operation, and is described in the current issue of the *Phil. Mag.*

The explosives branch of the Research Department at Woolwich showed a new type of isothermal calorimeter, with the aid of which measurements can be made of the rate of heat evolution from compounds undergoing slow decomposition. The substance is placed in a container of non-corrodible metal which is mounted in the centre of a massive bomb of a special alloy-steel of low thermal diffusivity. The whole of the spherical bomb is maintained at a definite constant temperature by immersing it in a carefully regulated thermostat. Rise of temperature of the central container through evolution of heat is counteracted by the cooling action of an electrical current passing junctions of different metals in contact with the container. Equality of temperature between the container and the inner walls of the bomb is gauged to within 0.0001 deg. C. by means of a series of thermo-junctions and a galvanometer, and the current through the Peltier junction necessary to maintain equality of temperature is a measure of the rate of heat evolution.

The Cambridge Instrument Co., Ltd., had on view a torsionmeter invented by Mr. E. B. Moullin, which will give a direct reading on an ammeter of the mean torque over a 4-ft. length of shaft of any diameter, or a continuous photograph of the instantaneous torque can be taken by means of a Duddell oscillograph. Two saddle pieces are clamped to the shaft at a fixed distance apart, one of which carries a laminated armature and the other an electromagnet, the position of the armature being so arranged as to be close to the electromagnet. A magnetic circuit is thus set up through the armature and the magnet core with only a small air gap, and when power is transmitted by the shaft any torsional movement in the length between the two saddles causes variations in the air gap between the armature and the core, the design of the electromagnet being such that its reactance and the air gap are connected by a linear law. Through the electromagnet winding is passed alternating cur-

rent supplied from a generator giving an electromotive force bearing a constant ratio to the frequency. Hence the current through the electromagnet is independent of the voltage and is a direct measure of the twist or torque in the shaft.

The method of Mr. A. Eidenow, Mr. Leonard Hill, F.R.S., and Mr. A. Webster of measuring ultra-violet radiation consists of exposing a solution of acetone and methylene blue, called 10, to light in a standard quartz tube so that it is bleached by the ultra-violet rays. The degree of bleaching is determined by comparison with a set of standard tubes containing varying strengths of methylene blue and numbered 10 to 3.

The Anglo-Persian Oil Co., Ltd., demonstrated apparatus that has been designed for the purpose of investigating the selectivity of lightning discharges, chiefly with a view to protecting its oil storage tanks abroad. The surface of a table on to which a spark from a h.p. source of supply (200,000 to 500,000 volts) was caused to flash was arranged to represent the earth and its different geological formations, selected objects being placed on this formation with due regard to their distance from the sparking point, and also their individual dielectric and conductive values, as well as the underground structure on which they stood. The experiments seem to indicate that it is better not to earth the tanks; they should simply rest on the ground, be free from projections and points, and should not be provided with lightning conductors. Instead a single conductor 50 ft. high placed by itself away from the tanks will protect a circular area ¼ mile in diameter. The nature of the ground on which the tanks stand seems also to affect the results, lightning showing a preference for striking those soils having a high specific gravity.

Prof. Gerald Stoney, F.R.S., and Mr. J. P. Chittenden, of the English Electric Co., Ltd., showed three models constructed to indicate the vibration of steam turbine disks and shafts. In the first machine, rotating rubber disks showed the waves of vibration in turbine wheels; the second was a stationary model disk illustrating the vibration of turbine disks with various nodal diameters, while the third device recorded the movement of a multi-loaded shaft when running through various critical speeds so that the movement could be photographed. On a ¼-in. steel shaft which has been ground down from a 2-in. bar, five disks are mounted, and on the opposite end of the shaft to the driving motor is mounted a small mirror which reflects a spot of light on to a ground glass screen. The movement of the circle of light on the screen indicates that the shaft is subjected to its first disturbance at half the first critical speed.

During the evening Mr. F. E. Smith, F.R.S., lectured on the subject of "Modern Navigational Devices," and conducted some interesting experiments therewith.

The British Industries Fair.

Birmingham Section.

Following upon the London Section which closed on May 9th, the Birmingham Section of the British Industries Fair was opened on May 12th by the Lord Mayor of Birmingham; the Fair closes to-day (Friday). As in previous years, both of the main aerodrome buildings and the corridor connecting them have been utilised, although the stands appear more widely-spaced. The electrical industry is represented by several firms, chiefly local companies, but the large electrical concerns are absent. We give below brief descriptions of those exhibits which are likely to be of interest to our readers.

Premier Electric Heaters, Ltd.

This company displays all its standard lines in electric heating and cooking apparatus. Among the appliances shown is the "No. 1150" 600-W bowl fire, which has a solid copper bowl and a heavy base. The bowl is of the correct formation to give a concentrated "beam" of heat and the result is very good. Double-purpose heaters are shown; these serve as radiators or boilers as required and are of sufficient size to boil a small kettle. The principal improvement in the firm's irons is a new form of moulded connector, which is of substantial construction and said to be able to withstand a temperature of 700 deg. F. without being damaged. The kettles shown are all of copper, the bodies being made in the company's own works, and finished effectively in nickel plate. Two or three new designs of fire are exhibited. These are fitted with coiled nichrome wire elements and a small stand for a kettle or other utensil.

Mr. John A. Harry Hunt.

A large collection of extremely artistic lighting fittings appears on this stand. There are floor and table standards in various art metal finishes fitted with decorative bowls and shades; English and Italian alabaster bowls; brackets of many designs; crystal glass bowls and hoods; and many other forms of lighting equipment. It has been found that if gasfilled lamps are placed in contact or in too-close proximity to alabaster bowls, the mineral is seriously affected by the heat. To obviate the destruction of these rather expensive articles, the firm has patented a device consisting of a soft metal "spider." This has accommodation for three lamps, and it rests on the inside of the bowl and keeps the lamps always at a fixed distance from the alabaster. The leads to the lamps are taken down the chains and become inconspicuous as compared with the centre flexible upon which a single lamp is suspended.

Carron Company.

As in previous years, this company displays its grates and cookers. The electrical section is well represented by three of the firm's cookers, several fires, and a collection of "Universal" appliances. The "No. 310" cooker shown (fig. 1) is a new design. The body of this, in common with all the company's cookers, is of cast-iron and mild steel, double-cased and packed with non-conducting material. It has an oven

Fig. 1.—The Carron "No. 310" Cooker.

measuring 14 in. wide and high, and 12½ in. deep. The elements are fitted at the top (600-W) and bottom (800-W), and there are two 1,150-W boiling plates, and a 1,500-W grill in the top of the cooker. All these are controlled by three-heat snap switches, with the exception of the grill, which has only one "heat." One feature of the appliance is the grilling chamber between the top and the oven, which is 14 in. wide, 4½ in. wide, and 11 in. deep. A table range is shown. This

consists of an oven 16 in. wide, 14 in. high, and 18 in. deep, with a loading of 2,500-W, mounted on a boiling table 4 ft. long and 2 ft. 6 in. high. In this are fitted three boiling rings of different sizes. The two oven elements and the two larger boiling rings are controlled by three-heat switches, while the smallest boiling ring has one "heat" only. The fires shown include two new designs fitted with the firm's standard 1,000-W elements; both have two bars.

Messrs. W. Canning & Co., Ltd.

This well-known electro-deposition company exhibits many examples of its work as well as plant for its execution. Included in the former are samples of plating in all metals, the most interesting being, probably, articles coated with chromium and cadmium—a fairly recent development. Chromium is shown to be very suitable for the sole-plates of electric irons, being able to endure the heat without pitting or losing its polish. Among the electro-deposition plant are a dynamo giving 1,000 A at 6 V, and a motor-generator set with an output of 250 A at the same voltage. Resistances for these are also shown, and in addition there is an electrically-heated enamelling or drying cupboard, a 2-h.p. polishing motor, and several types of plating barrels. The non-electrical exhibits include a lacquer-spraying outfit, which, of course, would find many applications in the electrical industry.

Mr. Oscar T. Baker.

Upon this stand is shown a selection of suction and blowing plant. Three examples of electrically-driven blowers for blacksmiths' forges are exhibited. In these the whole of the revolving parts are enclosed. The motor is mounted on ball bearings and has a double casing through which cooling air is drawn when the machine is running. By a simple mechanical arrangement the brush-gear can be drawn off with the end shield and the whole can be replaced by an unskilled man. By means of a special control system one blower can be made to serve two or more forges. An arrangement of dampers interconnected with regulators automatically regulates the speed of the motor according to the number of dampers open. The apparatus is illustrated in fig. 2. Two forms of combined suction cleaners and blowing machines are shown. These are

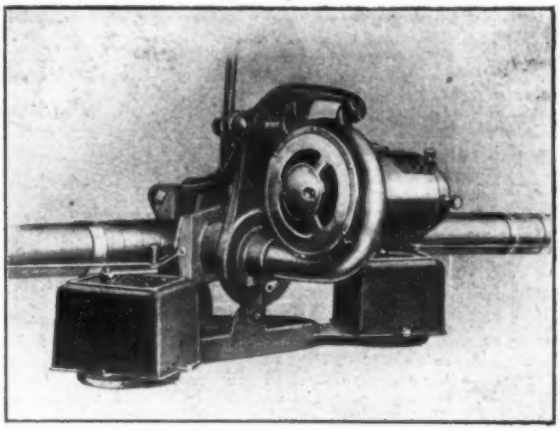


Fig. 2—A "Multi-Forge" Control System.

fitted with small motors, for either a.c. or d.c., and a metal casing in which is a dust container. By a simple adjustment the machine is converted into a blower of sufficient strength to clean out the interiors of electrical machinery. The machines are in two sizes, the larger for industrial use, and the other for employment in hotels and similar establishments.

(To be concluded.)

The Institution of Electrical Engineers.

Western Centre Visit to Lydney.

THERE was an attendance of over 160 members and guests at the joint meeting of the Western Centre of the Institution of Electrical Engineers and the Association of Mining Electrical Engineers (South Wales Branch) that was held on

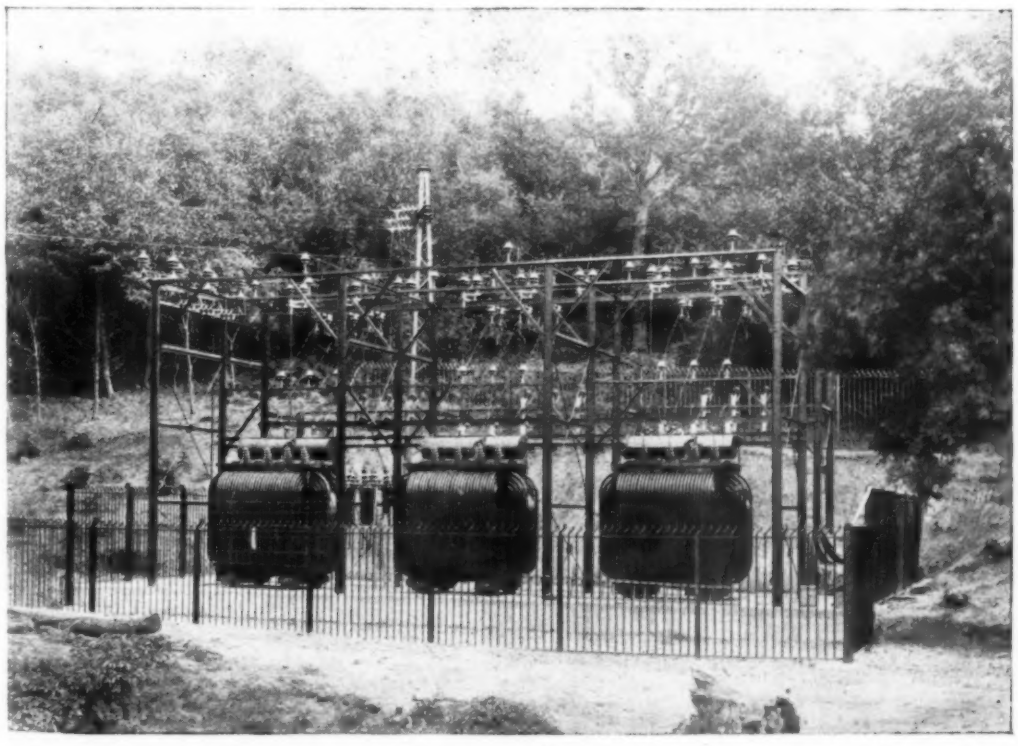


Fig. 1.—The Lydney 9,000-kVA, 33,000-V Open-air Sub-station.

May 3rd at the new electricity generating station of the West Gloucestershire Power Co., Ltd., at Lydney.

The steel, concrete, and brick station was built by the Foundation Co., Ltd., and within six months of beginning operations the first turbo-alternator was furnishing power to a colliery 10 miles distant. Another interesting feature of the scheme is the utilisation of h.p. submarine cables to carry power across the River Severn, where it is 1¼ miles wide, for industrial use in the Stroud Valley. The laying of these cables was described in our issue of February 1st, 1924, p. 172.

The station is situated in the Lyd Valley adjoining the

Severn and Wye railway; the area of supply is some 300 sq. miles, and includes the Forest of Dean coalfield, the Stroud and Nailsworth districts, Dursley, and Sharpness. The overhead transmission lines comprise a ring main, some 25 miles in length, for the Forest of Dean, and a line to the opposite bank of the River Severn that unites the Berkeley, Coaley, Dursley, and Stroud areas, approximately 15 miles in length, which is almost complete.

The main plant consists of two 5,000-kW, 3,000-r.p.m. Belliss and Morcom-Parsons turbo-alternator sets, with Worthington Simpson condensers, each having 7,500 sq. ft. of cooling surface, and pumps capable of circulatng 5,000 gallons of water per minute. There are also one 1,000-kW d.c. auxiliary turbo set and two 1,000-kW rotary converters by the Metropolitan-Vickers Electrical Co., Ltd., for auxiliary and outside supplies.

The boiler plant includes three Stirling boilers fitted with chain-grate stokers, each capable of normally evaporating 35,000 lb. of water per hour; the steam pressure is 260 lb. per sq. in., and the steam is superheated to a total temperature of 650 deg. F.

By means of Fraser & Chalmers coal-handling plant, fuel is conveyed from the railway sidings 250 yards away by an electrically-driven overhead belt conveyor to a Merrick belt weigher, and thence to the bunkers above the boilers; the conveyors are capable of handling 100 tons of coal per hour.

Situated some 300 yards from the generating station is the main 9,000-kVA outdoor sub-station (fig. 1), which steps up the generation voltage of 6,600 to 33,000 volts, which is the transmission pressure. The three Ferranti 3-phase, 50-cycle transformers (fig. 2) are oil-immersed and self-cooled, being connected in delta on the l.p. side and in star on the h.p. side with the neutral point out. Each is of 3,000 kVA capacity and of the "core" type, arranged to take circular coil concentric windings. Interleaved joints are made between the bottom yoke and the legs, but the top yoke is removable, the top of the legs and the underface of the top yoke being machined flat so that a satisfactory butt joint can be made between the two. Well-insulated bolts are used through the channel clamps and leg plates, and care is taken to ensure that no shearing strain is applied to the insulation due to the tension on the main vertical tie bolts. Heavy bolts passing vertically through the flanges of the yoke clamp, and also through the short rigid steel clamps placed across the yokes at the top and bottom, hold the complete core solidly together, and additional vertical bolts passing through the yoke clamps are provided to reduce the possibility of mechanical failure.

Axial movement of the coils is prevented by substantial insulating end-supports which butt against the flat surfaces formed by the inside faces of the yokes and channel clamps. These supports are designed so as not to interfere with the free passage of oil through the ducts and to allow of even distribution of mechanical pressure, thus preventing coil distortion.

The windings are of the concentric circular-coil type (l.p. spiral, h.p. disk), with the primary and secondary so placed in relation to each other that any mechanical stresses acting on the windings in a radial direction, as a result of external short circuits, are uniformly applied and do not tend to distort the coil shape. Care has been taken to guard against the effects of insulation shrinkage by assembling each leg of the h.p. coils complete with separators on special framework on which they were stoved, and then compressed to the final dimensions whilst hot, before placing them in position on the cores. In addition, Ferranti patent spring clamps are fitted at the centre of each set of coils so as to automatically take up any slight shrinkage which may develop during operation on circuit. Every turn of the windings is in direct contact with the oil.

The transformers are provided with a central point lift, and each is contained in a boiler iron tubular tank, strengthened and stiffened, all the joints being welded. The tanks are supplied with an oil level gauge, thermometer pocket, oil drain valve, and a set of swivel rollers which allow of the transformer being moved in any direction. Oil valves are fitted to the top and bottom of the tank for connecting an oil filter set, and conservator vessels are fitted, complete with calcium chloride breathers. These not only ensure that only dry air will come in contact with the reduced surface of oil in the conservator vessel and maintain the dielectric strength of the oil, but also prevent the formation of sludge by securing the absence of air in contact with hot oil in the main tank.

Following the inspection of the generating station, Prof. W. M. Thornton read his paper on "Some Researches on the Safe Use of Electricity in Coal Mines,"* which he illustrated with a number of interesting experiments and lantern slides. A discussion followed, Mr. C. T. Allan, chairman of the Western Centre, presiding, after which tea was served at the Feathers Hotel.

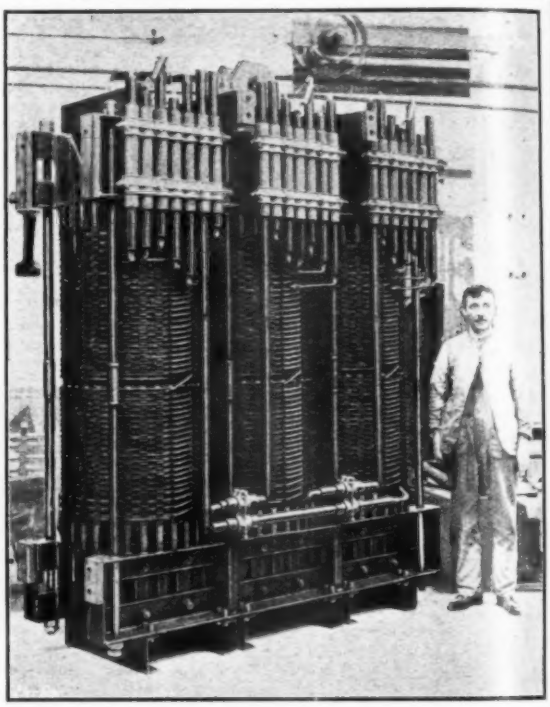


Fig. 2.—A Ferranti 3,000-kVA, 33,000-V Transformer.

For some of the above details we are indebted to the *South Wales News*.

Electricity Supply in War Time.

Effect of Improvements in Heavy-Oil Engines.

By A. H. Dykes, M.Inst.C.E., M.I.E.E., and W. T. Townend, R.N.

(*Abstract of paper read before the* DIESEL ENGINE USERS' ASSOCIATION.)

THE process of replacing the existing smaller local electricity generating stations by a less number of capital stations serving by means of h.p. feeder cables very large areas, the original stations in which gradually becoming mere sub- or transformer stations, is going on all over England, with the result that in a comparatively few years the supply of electrical energy will be centralised in a few stations situated for the most part on the banks of the larger rivers or on the seashore, so as to ensure an ample supply of cooling water.

Few of us in our hearts feel that it is possible to guarantee "peace for evermore," and when the next war breaks out it is practically certain that it will start with air raids on a gigantic scale; and it is probable, in fact almost certain, that future raids will be made in daylight by fleets of aeroplanes loaded with bombs, but carrying no pilot, the squadron being under the wireless control of a leader on a single plane with ability to fly at 100 miles per hour, and above the cloud level so as to be invisible from the ground. The bombers would have little difficulty in reaching the great majority of our capital stations, guided thereto by the fact that they are all situated on the banks of the principal rivers or on the coast.

The destruction of a capital station would paralyse the industry, and to a great extent the everyday life, of the area served by it; it would only be necessary to destroy a few such stations to interfere to a disastrous extent with the production of munitions on which warfare now depends. From the position and very conspicuous nature of the buildings themselves and of the coal dumps and railway lines leading to them, it would be almost impossible to camouflage them or put them underground without giving any indication of their presence. The result of our considerations has led us to the conclusion that if such dangers have to be taken into account, then the only practicable way is to provide a certain number of underground stations driven by heavy-oil engines.

The total quantity of fuel oil used in the whole of the existing Diesel-driven electricity stations in this country during

*ELEC. REV., Feb. 18th, 1924; p. 231.

1922 was approximately 30,000 tons, whilst the total quantity of heavy oil imported into the country per annum is probably in the neighbourhood of 1,500,000 tons. That before long it may be possible to rely on a cheap supply of tar oil of uniform quality seems to be very unlikely. The English tar oil production is somewhere about 300,000 tons per anuum, whilst the world's petroleum production is about 120 million tons. The tar oil, or creosote, industry is highly developed in England, but the demand for it for other purposes than power is much greater. The result is that in this country the price of creosote has nothing to do with its value as a source of power, and it will probably always command a higher price than Diesel engine users can afford to pay.

It is clear, therefore, that Diesel stations must rely on petroleum oil. The quantity of oil required for electricity supply stations would be a very small proportion of that required for naval purposes, the responsibility for providing which has already been assumed by the naval authorities.

In order to obtain low capital cost and high efficiency it has become necessary in capital stations to use steam turbines of from 10,000 to 20,000 kW capacity each, and the necessity for an abundant supply of condensing water has limited very greatly the choice of sites. The result is that vast sums have to be spent on feeder mains to the substations. An underground station, requiring little cooling water and engines which (even in small units) have a very high thermal efficiency, alters the situation entirely.

To consider the capital and running costs of such a station a maximum output of from 13,500 to 14,000 kW has been selected, which would be large enough for a considerable area and the station being situated at or near the centre of the load it would avoid large expenditure on bulk supply mains. A Diesel alternator having a capacity of 3,500 kW (5,000 b.h.p.) has been selected as the unit, and engines of 4,000 b.h.p. of a similar design to those proposed are already at work at sea. The engines would be of the opposed-piston type, with eight cylinders, and a piston speed of 750 feet per minute at 150 revolutions per minute, which has a very beneficial effect on the wear of liners and pistons, thus reducing the running costs. The station would be equipped with five such sets, one being in reserve, and could be located anywhere, even in the heart of a town, as the ground above it could be used either as a recreation ground, a playing field, or could be covered by buildings. There would be nothing to prevent such a station being placed under a block of buildings, such as that over Victoria or St. James's Park stations on the Underground railway.

The auxiliary motors would be normally supplied from a "works" transformer, but in parallel with it would run a 450-kW Diesel-driven l.p. alternator which would supply light in the event of a failure on the main board, and also provide power when starting after a shut-down of the main engines. The cooling water required would be 200,000 gallons per hour. Such a supply could in most situations be easily obtained from a neighbouring stream, or advantage could be taken of a pond or ornamental lake near the station and an area of 500 sq. yards, about one-tenth acre, would provide sufficient cooling surface. The amount of water required to make up for loss by evaporation would not exceed about 10,000 gallons per hour. In the estimates the cost of building such a pond has been included. From the pond the water would flow by gravity through the engines and be returned by means of electrically-driven circulating pumps. The main engine room would be 150 ft. by 68 ft. wide by 43 ft. high. On one side would be the main switchboard, offices, &c., and on the other the oil storage tanks, pump room, oil control room, &c. As by hypothesis the station would only supply a compact area, the voltage would not exceed 6,600 volts, and the large space necessary for switchgear in the usual capital station would not be required. Fuel oil storage for 640 tons, sufficient for one month when working at a 25 per cent. load factor, would need two reinforced steel tanks, each 18 ft. 6 in. by 10 ft. by 68 ft. long, and it is interesting to compare this with the space required for coal storage at an ordinary capital station driven by steam. The tanks would be filled by a pipe line run to the nearest railway-siding or wharf. In some of the oil engine stations under their control the authors are already using ordinary furnace oil in place of the more expensive Diesel oil. It has a calorific value of 19,200 B.th.u. and actually costs at present £4 per ton delivered into the storage tanks at the electricity works, and requires nothing more than the ordinary screen filters. If, however, the asphalt content exceeds about 1 per cent. then centrifugal separators are advisable.

Filtering and cleaning the lubricating oil are of the utmost importance. In many of the smaller Diesel stations of the past the cost of lubricating oil per kWh has been as much as the cost of fuel. A certain station in 1921 was running with a total of 1,080 b.h.p. in five engines, and although the sets were not always working at full load the actual consumption per unit generated was, for 1921 and 1923 respectively, .0175 and .0049 pint. Allowing for the loss in the dynamos this means a consumption per b.h.p. hour *actually run* of .0117 in 1921 and .00328 in 1923, which shows that the plant factor of the station was of the order of 60 per cent. These considerations emphasise the advisability of having a sufficient number of sets to allow that all running sets are fully loaded rather than having a few large sets running part of the time lightly loaded. In other words, a high plant load factor is still more important in a Diesel station than in a steam turbine station, as, while it does not affect the fuel consumption so much, it greatly reduces the lubricating oil consumption per unit generated.

Similar figures taken from a station in India having a total engine capacity of 3,360 b.h.p., gave for 1922 a consumption of .0055 pint per b.h.p. hour (assuming engines always running at full load) and an actual consumption per kWh generated of .0153 pint, the plant load factor being lower in this case and the engines having been rated down owing to the tropical conditions obtaining. From the use of centrifugal oil filters very considerable economy has resulted, and even this fine result can be improved upon if the oil is treated continuously in the purifier instead of once a week, provision for which has been embodied in the design now under consideration.

An electrically driven blower would inject air through a suitable nozzle into the upcast pipe from the expansion chamber so as to draw away the exhaust gases. The blower would suck its air from the engine room and, in conjunction with the scavenging air blowers, ensure a regular supply of fresh air being drawn into the station.

Various well-known contracting firms have checked the capital cost and it may be taken therefore that the figures represent actual present-day prices at which contracts could be let. Since the ground over the station can be utilised for any purpose desired, the final capital outlay on the site should be very little, the chief ultimate expenditure being on the entrance to the inclined roadway. It has been assumed that the station has been built on level ground, which had to be excavated the full depth. Obviously in some localities the amount allowed might be reduced considerably. The total capital cost of the entire station works out at £408,000, or £23 5s. per kilowatt of plant installed. Actual prices have been received for the plant, the cost of the main engines, alternators, exciters, blowers, compressors, and the house service set, including erection, working out at £14 5s. per kilowatt. When to the cost of a capital station is added the cost of the trunk mains, it will be realised that moderate sized Diesel-driven stations can compete even on the basis of capital cost.

The running costs are based on a maximum load on the feeders leaving the station of 13,500 kW, with a load factor of 25 per cent., giving an output of 29,565,000 kWh per annum. The fuel consumption is taken at .65 lb. of boiler oil per kWh generated, a figure which is already obtained in more than one oil-driven station under the authors' control. The price is taken at £4 per ton, which the authors are actually paying at the present time. This works out at .28d. per kWh generated, say .35d. per kWh sold. Lubricating oil has been taken at .00061 gallon per kWh generated, a figure already obtained in one of the author's stations, which could, however, be reduced. At 3s. per gallon, this works out at .022d. per kWh generated, or .027d. per kWh sold.

It is in wages that one of the greatest savings is made owing to the elimination of the boiler house and ash-handling staff. A running staff of 28, exclusive of men engaged on repairs and maintenance, would cost £6,055 per annum, or .049d. per unit generated or .06d. per unit sold. A Diesel station can be kept running by a much smaller number of men, who are, however, more highly skilled than the average of those in steam stations.

Many engineers not actually familiar with modern heavy-oil engines hold exaggerated opinions on the cost of upkeep and liability to breakdown. The authors have assumed that two fitters and three mates, apart from the running staff, will be constantly employed on repairs and maintenance work. The cost of a new piston and liner for one of the proposed engines is £500, or £4,000 per engine, and experience shows that one complete renewal every five years, or £800 per annum, would be more than sufficient, particularly having regard to the low piston speed. In addition the engines have no valves and no cylinder covers, so that the usual cost of upkeep of these two items is eliminated. The cost of upkeep of station buildings is likely to be very low and £6,000 should be an ample allowance. This works out at .048d. per kWh generated, compared with .042d. at the steam station.

As in addition to the generating plant the steam station has the upkeep of boilers, economisers, ash handling plant and above ground buildings, the figure suggested for the underground station appears to be a conservative one. It is also borne out by the figures published by the D.E.U.A., which are as low as .012d., .023d., .032d., and .045d. The resulting total shows that as regards running costs also the Diesel-driven station can compete with a capital steam turbine station, and that even if the Air Ministry is prepared to guarantee that no hostile aircraft can harm capital stations, the internal combustion engine is still a factor which must be taken into account in considering the large scale production of electricity.

Some of the proposals made above may appear revolutionary and the conclusions arrived at startling, but the following considerations must be kept clearly in mind:—

1. Such a station can be put down anywhere, and the cost of the site can be recovered later as the ground surface can be utilised for other purposes.

2. The choice of site is not limited by the necessity of access to large volumes of water for condensing.

3. The cost of the usual coal sidings and coal stores is avoided.

4. There is no boiler house; the cost of upkeep of boilers is eliminated, as is also the cost of disposing of the ashes.

5. The thermal efficiency of such a station is 29.1 per cent., whilst the highest figure recorded in the Electricity Commission's Report for 1922 for a steam station is only 17.2 per cent.

6. As such stations can be placed in the centre of the load, all cost of trunk mains and big substations is avoided.

7. The number of men is very greatly reduced, and the kWh produced per man approximately doubled, and in times of crisis such a station could be kept running with a small nucleus of intelligent men.

8. Energy being generated in several such stations in the middle of the load area the supply is not so liable to interruption as when a very large area is supplied from one capital station.

9. The maximum protection is afforded in time of war when the supply of electrical power is the heart blood of the nation.

The London and Home Counties Electricity District.

Commissioners' Third Inquiry.

(*Concluded from page 788.*)

BEFORE the discussion on the sliding scale in the agreement was resumed on May 13th, one or two other matters were cleared out of the way. In the first place, the Charing Cross Co. was not willing to give unqualified assent to the price to be paid for its City undertaking being left to the Commissioners, and, in respect of the London Electric Supply Corporation, there was a question of what to do with regard to the £205,000 standing in the books as representing the purchase, many years ago, of the Grosvenor Gallery installation which was burned down soon after it was acquired. The L.C.C. said that there were no assets now represented by that sum and, therefore, it could not be taken into account in the transfer of the undertaking to the Joint Electricity Authority in 1971. The Commissioners offered to meet the L.C.C. and the companies privately some time to see if a way out can be found, because these appear to be the only substantial points of disagreement between the L.C.C. and the companies.

Then SIR JOHN SNELL read the terms of the new clause 12, which, however, did not please Hornsey, Finchley, and Walthamstow. They, in fact, took very strong objection to the new wording on the ground that, although the new clause removed compulsion, it seriously modified the powers of the local authorities in other respects. It was explained that the Commissioners had no such intention and a discussion is to take place upon the matter later.

The rest of the day was occupied in further discussion of the agreement and the sliding scale, and the City of London Corporation gave evidence through Mr. W. B. KEEN, accountant. The consumers in the City were smarting under what they believe to be a very real grievance, inasmuch as in 1920 the supply companies obtained an Order increasing the maximum price from 5d. to 8d. per kWh and, according to the accounts, the immediate result was a large increase in dividends as well as the allocation of large sums to reserve. Hence, Mr. Keen took what he called a root and branch objection to any scheme which did not provide for a sliding scale operating in both directions; although the precedent created since the war of having the slide only after the companies had been guaranteed a certain minimum dividend was admitted, it was regarded as a retrograde step. The case for the City was that the companies were being treated far too generously. Mr. Keen had a fairly warm time with cross-examining counsel and some of the Commissioners. The Chairman doubted whether the Commissioners had the power to remove the present maximum price clause in the various companies' orders, which was implied in the agreement; Mr. Keen's views as to the manner in which the proposed agreement would operate did not seem to them to be based upon an appreciation of the fundamental principles underlying the agreement. However, Mr. Keen stuck to his point and a strong point was made of the contention that on the basis of arriving at the standard price, as proposed in the draft agreement, it would be possible for the companies to keep the price to lighting consumers very high and to reduce it to large consumers; thus, so it was argued, getting a higher dividend for the shareholders without a reduction in price to the lighting consumers. That was one construction put upon the agreement by the City Corporation, although everybody on the other side said that such a thing could not happen.

Another point of objection was the proposal to create a sinking fund to represent the capital assets at the end of 1971, and Mr. Keen's point was that if proper depreciation were set aside year by year, there would be no need for a sinking fund; in any case, the establishment of a sinking fund should not begin until the undertakings were actually taken over in 1971, such sinking fund to be created by the purchasing authority. After considerable argument both sides agreed that there was no need for a sinking fund as well as provision for depreciation, and Mr. Keen adhered to his contention that the companies were being treated far too generously in the matter of minimum dividend under the agreement and that the consumer was not sufficiently safeguarded. It was also urged that the large reserves which the two City companies had set aside since the Order was granted, enabling the maximum price to be increased, ought to go to the consumer.

The CHAIRMAN reminded Mr. Keen that the inquiry was not into what the companies had done in the past, but into how the whole position could be regulated in the future.

MR. CASH followed with some instances of how the proposed sliding scale would work in practice, but although they related to specific companies, he made it clear that the figures were not binding in any way.

MR. A. F. HARRISON (secretary of the City of London Electric Lighting Co.), then gave evidence and discussed certain possible difficulties in ascertaining the standard price on the lines laid down in the agreement, although, of course, his company agreed with the general principles laid down.

MR. SAMUELS made representations on behalf of the consumers in the City of London—although the City Corporation had previously claimed to represent them. His speech brought out the interesting fact that the City Corporation—of which Mr. Samuels is a member—and the London Chamber of Commerce had petitioned the Electricity Commissioners to repeal or modify the Order granted to the two City companies in 1920 increasing the maximum price from 5d. to 8d. He also quoted instances of excessive electric light bills in the City, compared with what could be obtained at a much less cost in Stepney, only half a mile away. Here, also, the Chairman had to intervene in order to keep the discussion within the proper bounds, but Mr. Samuels focussed his point by urging upon the Commissioners the undesirability of fixing any sliding scale of dividends upon the dividends paid in 1922 or 1923, having regard to the high maximum charge being made.

The inquiry was adjourned until Wednesday, May 14th, when Mr. TYLER (for the Middlesex County Council) suggested that the Commissioners might put to the power companies the desirability of their coming under a sliding scale in a similar manner to the London companies, but SIR JOHN SNELL reminded Mr. Tyler that the Commissioners had no power to do so and that the better way would be for the Middlesex County Council to endeavour to arrange it by negotiation.

The question of the exclusion of the areas of local authorities from power company areas was then further discussed, and Mr. MONTGOMERY, K.C. (for Hornsey, Finchley and Walthamstow), claimed that such districts could supply themselves more cheaply than a power company could do, but his main point was that he wished to be in the area of the Joint Authority and not left solely in the area of a power company for the reason that so doing would give Hornsey a competitive supply if it required it later. Although it was true that the three councils in question had an absolute veto, the position was that every time they applied for an extension of their system they were put to great expense by the opposition of the Power Co., and the general result was that the development of the undertaking was hampered. Again, Hornsey would have to contribute towards the expenses of the Joint Authority, but under the scheme at present could not get any supply from that authority. He agreed that after the Joint Authority was formed it would be possible for local authorities, through the Joint Authority, to apply to the Commissioners for exclusion from a power company's area, but the present was the only opportunity on which local authorities individually could apply for exclusion, and as they were given that statutory right they were entitled to avail themselves of it. He differed from the view, put forward by Mr. Booth, one of the Commissioners, that individual application at the time of making an Order—such as the present—was only intended to apply to areas which were remote and not likely to get a supply from a power company, whereas application later through the Joint Authority was intended to apply to the very instance of Hornsey, Finchley, and Walthamstow.

Other applications were made for exclusion from the areas of what were described as power companies, but SIR JOHN SNELL said the Commissioners were advised that most of the

companies concerned were not power companies in the accepted sense, such as the North Metropolitan and the Metropolitan Companies. The reply on behalf of these authorities was that, as the point was doubtful, they wished to be able to go to the Joint Authority for a supply.

SIR JOHN SNELL, speaking upon this general point, and the suggestion that the Joint Electricity Authority could not function without the consent of these companies, when it came into being, said that if this view were correct, then it did not seem that the Joint Authority would ever be able to function at all. The Commissioners were advised, however, that the majority of the companies concerned were not statutory power companies and there would be difficulty in putting clauses in the Order relieving the local authorities from a position they were not in.

MR. BEVERIDGE (who replied for the North Metropolitan Power Co. upon the application for exclusion by Hornsey, Finchley, and Walthamstow), said that the whole of the fears that had been referred to could only arise in the future, if at all, and then they could be dealt with on their merits in a proper way. At the same time, he protested against any interference with the company's Acts of Parliament under which a considerable sum of money had been invested in order to place the company in a position to supply these districts. Moreover, he reminded the Commissioners of the decisions which they issued at the end of 1921 in which it was stated that nothing would be done to interfere with existing rights. Speaking generally, he said that if the Joint Electricity Authority were to give a supply in the areas now asked to be excluded, it would mean the laying of duplicate mains because the power company was in a position to supply at any time.

MR. MOSLEY (for the Metropolitan Electric Supply Co.) also opposed the Commissioners doing anything which would interfere with the power supply authority given to the company under its various Acts, apart, of course, from its provisional order area, which was dealt with in the agreement with the L.C.C.

SIR HERBERT NIELD, K.C. (on behalf of the Hertfordshire County Council), opposed any intereference with the power companies, and said his Council was quite satisfied with the present position.

MR. HODSON, who began the reply on behalf of the Conference of Local Authorities, said the desire of the local authorities was not to make the position of the power companies worse than it was at present, but to prevent the position of the local authorities being made worse by making it impossible for them to get a competitive supply.

MR. MONTGOMERY (for Hornsey) intervening, said he wished to make it clear to the Commissioners that the local authorities individually would have no other opportunity than the present of applying for exclusion. Sir JOHN SNELL said that was the first time this point had been brought to his notice.

On May 15th Mr. TURNER continued the reply begun by Mr. Hodson. He pointed out that the list of local authorities which had been criticised as containing some authorities which were not in the area of a power company, was not a part of the clause. If there were some in this category, then the clause would not apply, but the position in many cases was ambiguous and the clause would give protection should it be held elsewhere later that these authorities were all within the areas of power companies.

SIR HARRY HAWARD asked whether it was wise to put a clause in the Order, the effect of which was uncertain, and Mr. Turner replied that the clause was in general terms for the protection of those authorities which were within the area of a power company, although at the moment there seemed a difference of opinion as to which of the companies were power companies within the meaning of the Electricity Supply Act.

SIR JOHN SNELL suggested that probably a better way would be to wait until the Joint Electricity Authority came into being and had surveyed the ground. Then it could come to a decision whether any area could be better served by a power company or the Joint Authority, and it could apply to the Commissioners, if necessary, for the exclusion of an area from a power company's area. It was not as if the door were closed to the local authorities.

MR. TURNER said the objection to that was that in the meantime a local authority might have been compelled to go to a power company for a supply and then it would be said that, as a supply was being given, an application for exclusion of the area from the power company's area could not be made. The position of the Conference was as follows:—"The whole scheme is based upon the formation of a Joint Electricity Authority, with local authority representation. The scheme deals primarily with local authority stations, but the Conference of Local Authorities can have no interest whatever in the establishment of a Joint Authority which means the sacrifice of any of their existing liberties and powers. They are advised that under the present statutes, as proposed the scheme would very seriously infringe the rights and powers of a large number of local authorities. In these circumstances without the exclusion of all local authority authorised undertakers from the area of power companies, as defined by the Statutes, but at the same time without prejudice to the existing powers of power companies, the local authorities cannot accept the Order and must oppose it in every possible way even to the extent of refusing to elect their representatives on the Joint Electricity Authority after the Order is made. There are alternative proposals which have been put forward by the Conference, such as a Joint Committee of Local Authorities, which would avoid the whole question of the position of the power companies."

The CHAIRMAN said he could not understand how it could be said, in view of the way in which the local authorities' fears had been met, that the Order interfered with the rights and liberties of the local authority undertakers. If a local authority had a veto over the supply in its area by a power company and it elected to transfer to the Joint Authority, then the Joint Authority could apply to the Commissioners to exclude the area from the area of the power company, because in such a case it appeared that the Joint Authority could not supply the area without the consent of the power company. That in itself would justify the Joint Authority asking for the exclusion of the area.

MR. TURNER, for the Conference of Local Authorities, agreed, but again pointed to the difference, because after the Order was made the local authority itself could not apply for exclusion.

The CHAIRMAN agreed that the Order, so far as the Joint Authority was concerned, affected the local authorities primarily, but the local authorities had larger representation than the other bodies.

MR. TURNER pointed out that as compared with all the other interests on the Joint Authority, the local authorities were a minority.

SIR HERBERT NIELD, K.C. (for the Hertfordshire County Council, and he has supported the North Metropolitan Power Co.), said that so far as it had been said that the North Metropolitan Power Co. did not supply in Hornsey and Finchley, the company had been giving a supply for traction purposes in those districts for 20 years.

SIR JOHN SNELL said unfortunately that made the position rather worse from the point of view of the opposition of the local authorities. If the Commissioners concluded that this was not the proper time to accede to Mr. Turner's request to exclude certain areas from the power companies' areas, then the Conference would not desire the establishment of the Joint Electricity Authority, but would prefer to go on under the present conditions.

MR. TURNER replied that there were alternative methods, such as the formation of a Joint Committee.

SIR JOHN SNELL: But if such a Joint Committee were formed, the Commissioners could not possibly give it any powers to exclude. I cannot understand the logic of the position myself, although I do not bind the other Commissioners. If this were the one and only opportunity upon which you could apply to the Commissioners for exclusion there would be considerable force in your argument, but it is not the only opportunity. You have asked us to accept an emasculated technical scheme; you are not prepared to say whether your local authorities are prepared to transfer their stations and you have even asked us to cut out from the Order any reference to interconnection of the stations, which was a cardinal point of your own original scheme at the time of the 1921 inquiry. Now you go farther and ask us to exclude all your areas from the areas of the power companies without in the least knowing what the technical scheme of the Joint Authority is to be. Surely the proper time to come to the Commissioners for exclusion is after the Joint Authority has had an opportunity, with your assistance, of surveying the whole position.

MR. TURNER: I do not think I can add anything to what I have already said. My statement was definitely based upon resolutions of the Conference.

This closed the discussion on the exclusion of local authority areas from power company areas.

With regard to Clause 12, which relates to the transfer of generating stations and main transmission lines to the Joint Authority, and has already been the subject of amendment by the Commissioners, without, however, altogether meeting the objections of the local authorities, Sir JOHN SNELL asked if it would shorten matters if the third annex were removed from the Order altogether—this specified the generating stations and main transmission lines or interconnecting lines of local authorities to be transferred?

The local authorities expressed their satisfaction with this, subject to any points arising after closer consideration.

On Clause 30 of the first schedule, which provides that authorised undertakers shall furnish maps, plans, &c., to the Joint Authority, the Commissioners agreed to add words to the effect that the reasonable cost of such maps, &c., shall be met by the Joint Authority. This satisfied the local authorities, but Mr. SYDNEY MORSE and Mr. KENNEDY, for the companies, argued that they should not be compelled to furnish such information for the reason that the Joint Authority would have no jurisdiction in their areas. Moreover, it was suggested that it would be an infringement of the agreement between the L.C.C. and the companies. Eventually, the Commissioners decided to remove the companies from the operation of the clause.

Clause 33, giving the Joint Authority power to borrow up to £10,000,000, was passed without discussion.

At this point there was a long discussion at the instance of the Local Government Board Officers' Association and the Electrical Power Engineers' Association with regard to the insertion of clauses providing for compensation to officers for loss of office. Under the Electricity (Supply) Act, 1919, Sec-

tion 16, compensation is payable to any officers deprived within a period of five years of the passing of that Act, in the case of any transfer, and the request was that that should be extended so as to begin from the date of the passing of the present Order. The Commissioners expressed doubts as to their ability to alter the position in that way. The point is that the five years provided for in the Act of 1919 will have expired before any transfer under the London Order is made. It appears that in the Ayrshire Order such an extension as that now asked for has been made, although the Commissioners seemed a little surprised that it had been done. It was suggested that it might have been done by agreement, whereas in London the East End companies, at any rate, object to any such extension; their point was that it was not within the power of the Commissioners to alter the terms of the 1919 Act in this respect. As regards the Electrical Power Engineers' Association, the West End companies have agreed to such a clause in their Bill now before Parliament, but the East End companies would not make that concession.

Clause 39 of the first schedule, which deals with the apportionment of the expenses of the Joint Electricity Authority, gave rise to considerable discussion. As the Order stands, the London County Council has agreed to pay £500 per annum; the County Councils have each offered to pay £50 per annum, and the Railway Companies' Association has agreed to pay £100 per annum, but there is no compulsion upon them to do so. For the rest, the authorised distributors in the area are to meet the expenses on a units sold basis. The North Metropolitan Power Co. is to pay £250 a year.

Mr. Turner (for the Conference of Local Authorities) asked that the amounts to be paid by the L.C.C., the County Councils, and the Railway Companies' Association should be increased and that the North Metropolitan Power Co. should be put on a units sold basis.

Mr. Montgomery (for Hornsey, Finchley and Walthamstow), objected that the amounts to be paid were not obligatory, but Sir John Snell said there was no power to make them so.

Mr. Montgomery said that £50,000 per annum had been mentioned at the 1921 inquiry as the expenses of the Joint Authority during the first few years and the local authorities would have to find the greater part of it.

Sir Harry Haward said there was a good deal of misconception about the point. The expenses of the Joint Authority ultimately would be largely attributable to generation and therefore would legitimately fall upon the authorised undertakers taking a supply. The actual administrative expenses would then be very small.

Sir John Snell added that as the North Metropolitan Power Co. did not benefit from the supplies of the Joint Electricity Authority as the others did, it was not thought that that company ought to be upon the same basis.

Mr. Kennedy (for the West End Companies), asked that only those authorised undertakers who received supplies from the Joint Authority should be asked to contribute to the expenses.

Mr. Morse for the other companies said that at any rate until 1971 the companies would probably have nothing to do with the Joint Authority, and he also asked for relief in the same way as Mr. Kennedy, and that only a nominal amount should be paid by the Kent and West Kent Power Companies.

Sir Herbert Nield said the apportionment of the expenses of the Joint Authority made his case for the total exclusion of Watford from the area stronger than ever, because as matters stood Watford would have to pay £500 a year towards the expenses and yet could not get any possible benefit from the operations of the Joint Authority.

Mr. Edgar Macassey (for East and West Ham), supported the application for the proportion paid by the L.C.C. and others to be increased. On the units sold basis, and taking the sum of £50,000 already mentioned, West Ham would have to provide £4,000 a year.

Mr. Baker (for the North Metropolitan Co.), asked that his contribution should not be more than £250—it could be made more under the Order, at present.

The Town Clerk of Croydon objected to having to pay any share of the generating expenses, seeing that Croydon was one of those places on the fringe of the area that were not likely to get any assistance from the Joint Authority. He did not object to paying a share of the purely administrative expenses.

The Town Clerk of Gravesend asked that their share should not exceed £100 for a similar reason. It was also asked that there should be protection for Gravesend from the Joint Authority supplying in Northfleet—now supplied by Gravesend—so long as Gravesend was willing to supply upon terms as good as those offered by the Joint Authority.

Questions relating to the protection of county authorities with regard to bridges and roads were also discussed, and a proposal by the London companies that there should be a definite date for the coming into force of the Order was opposed by the L.C.C., on the ground that it took away from the Commissioners the power to fix the date in accordance with circumstances. One of the conditions of the L.C.C. was that the agreement with the companies should be signed and sealed before the Order came into force.

Sir Harry Haward said that the Commissioners wished the fixing of the date to be a little flexible.

The inquiry then closed.

The Lanarkshire Hydro-Electric Power Bill.

(*Concluded from p. 786.*)

In the course of evidence on behalf of the promoters, it was said that the cost per kWh of electricity developed at the falls was estimated to be 0.25d.

Evidence on behalf of the Clyde Valley Co. in support of the Bill was given by Mr. Robert Robertson (a director); Mr. James Annan (Town Clerk, Lanark) supported the Bill on behalf of the Town Council.

In connection with the opposition of Sir Charles Ross, Mr. Ross (late of Messrs. Ross & Holgate, consulting engineers, Montreal), who has had a large experience of hydro-electric schemes in Canada, referred to a report he had made for Sir Chas. Ross in 1912 on the utilisation of the Clyde Falls for electricity purposes. He submitted that his scheme was on the lines of the scheme now put forward by the promoters of the present Bill. The plant to be installed under his scheme would develop 12,000 kW, and the capital cost was to be £246,105. The cost of generation would be 0.11d. per kWh.

In the course of cross-examination, Mr. W. E. Tyldesley Jones, K.C., for the promoters, put a number of questions to witness to show that Mr. Ross had not included in his estimates any margin for the purchase of land rights, water rights, and so on, nor had he considered distribution at all. Again, witness had worked on the basis of a load factor of 100 per cent., whereas 40 per cent. was a high load factor for this country.

Mr. T. M. Cooper, who appeared for the Lanarkshire County Council, said that the County Council was the authorised undertaker under eight or nine separate Electricity Orders. It had been, for the last 15 or 20 years, working in harmonious co-operation with the Clyde Valley Co. in developing the distribution of electricity throughout the county. The scheme which they had been operating was one under which the Clyde Valley Co. had undertaken the function of generation, and the County Council had assumed the responsibility for the finance and the general administration of distribution. The company and the Council were contemplating extensions in areas of the county not yet developed. Counsel claimed, therefore, that the position of the County Council was a special one. It had not a word to say in criticism of the feasibility or desirability of the technical hydro-electric scheme. The West of Scotland Electricity District was in being, and the West of Scotland scheme, which was considered by the Electricity Commissioners a fortnight ago, intimately affected interests more important than any represented in the case of the scheme covered by the Bill. The kernel of the West of Scotland scheme, which was promoted by the Lanarkshire County Council, the Clyde Valley Co., and 16 or 17 local authorities of the district, was that for the future co-ordination should be secured, under the influence, and subject to the initiative, of an advisory board. Even if the scheme embodied in the present Bill were wholly admirable, the County Council would oppose it at the moment as being premature and inopportune. It was felt that, to approve of the Bill, with its underlying principle, was to take a definitely retrograde step. When the West of Scotland Advisory Board came to consider the water power in this area, it would find that the only source of water power had been appropriated as the result of the passing of the Bill. The greater expedient (the interests of the wider area) should outweigh the lesser expedient, and he suggested that no harm would be done by delaying the scheme in the Bill. If the Electricity Commissioners approved of the larger scheme, then the promoters of that scheme would be doing what the promoters of the Bill intended to do, but would be doing it in a manner more advantageous to the public. Counsel upheld the suggestion of the Ministry of Transport, that the generating stations proposed should not be erected without the consent of the Electricity Commissioners. The Ministry desired that provision in order that they might retain some control of the working of this scheme.

Mr. Tyldesley Jones, summing up for the promoters, emphasised that the public interests could not but be served by the carrying out of the scheme in the Bill which was in accordance with the ideas underlying the Electricity (Supply) Act, 1919, and urged that delay would mean expense, which would ultimately come out of the consumers' pockets.

The Committee decided that the Bill should proceed.

Parliamentary.

[By Our Special Parliamentary Reporter.]

B.B.C. Profits.—On May 12th, Mr. Hartshorn, Postmaster-General, informed Mr. Baker that he had no information as to whether the proposal to broadcast the King's speech at the opening of the British Empire Exhibition led to an enormous increase in the sale of wireless apparatus, as the result of which the "Marconiphone" firm exhausted its stock. As to whether, having regard to the profits which were being made, he was satisfied to leave the control of broadcasting to a private company, he pointed out that the British Broadcast-

ing Co. did not manufacture or sell wireless apparatus, and he saw no reason why increased sales by other firms should affect the arrangement under which the company was licensed to undertake broadcasting in this country.

MR. BAKER asked whether the profits of the Broadcasting Company were not very greatly in excess of what was anticipated when the company was formed.

SIR H. BRITTAIN inquired whether it was not owing to the fact that this matter had always been left to private enterprise that the profits had been so great, and, so far as Government wireless was concerned, had it not always resulted in a loss?

CAPTAIN W. BENN asked whether the Postmaster-General intended to maintain the embargo on the importation of foreign sets.

MR. HARTSHORN said the last question did not arise out of his original answer. With reference to profits, under the terms of the licence issued to the Broadcasting Company it could not distribute more than 7½ per cent. to its shareholders. Any additional profits must be used in developing the service.

Oscillation.—On May 12th, Mr. HARTSHORN informed Mr. Baker that no complaints had been received by the Post Office concerning interference with the reception of broadcast programmes in the Windsor district by the misuse of reaction by persons in possession of valve receiving sets. Such misuse was generally the result of want of knowledge, and the British Broadcasting Co., the radio societies, the radio trade, and the Post Office, were endeavouring in various ways to promote the more careful use of apparatus in this respect. The Post Office had made representations to a number of persons who were suspected of causing interference, and as a last resource a licence could be cancelled in any case in which the persistent misuse of reaction could be proved.

The Westray Cable.—On May 13th, Sir R. HAMILTON asked the Postmaster-General when it was intended to repair the Westray cable, which had been out of service since January.

MR. HARTSHORN said he was sorry that there had been greater delay than was anticipated in carrying out the repair of the Westray cable, owing mainly to the fact that both the Post Office cable ships had had to undergo refit and that the work on one of them took much longer than was expected. In the meantime other cables broke down, and, in view of their importance, had to be given precedence in repair. The Westray cable was included in the programme for the next trip of the cable ship *Monarch* and he hoped that it would be possible to carry out the repair in about three months' time.

British Empire Exhibition.—On May 14th, Mr. LUNN, Secretary to the Overseas Trade Department, moved a resolution to increase the Government guarantee for the British Empire Exhibition from £100,000 to £600,000. He said that the cost borne by the Exhibition authorities directly up to the opening of the exhibition was £2,823,000, less revenue £594,000, or a total of £2,229,000. There was a further sum of £379,000 required to complete the construction, which could not be met from revenue. That was the reason why the Government was asking that the original guarantee of £100,000 should be increased to £600,000. It was estimated that the total expenditure of the exhibition, so far as the Board of Management was concerned, would amount to £3,720,000, of which the purchase of the freehold and the leasehold of the site represented £99,000. It was estimated that 30,000,000 people would visit the exhibition. If these figures were realised the revenue would amount to £2,350,000, while, on the same basis, concessions and entertainments should bring in £950,000, or a total of £3,800,000, against an estimated expenditure of £3,720,000.

After some debate, the resolution was agreed to.

London Traffic Bill.—Standing Committee "B" of the House of Commons, in resuming consideration of the London Traffic Bill, dealt with Clause 7, which gives power to the Minister of Transport to limit the number of omnibuses plying on certain streets within the City of London and the Metropolitan police district.

VISCOUNT CURZON moved to omit section (*b*) of the Clause, which enables the Minister to exercise powers of limitation if he thinks it desirable to do so in view of the existence of alternative traffic facilities. He contended that the section would enable the Minister to restrict an omnibus service because there happened to be a tube railway or a tramway service in the neighbourhood, suffering from omnibus competition. The Minister's powers might be invoked to increase the profits of the Underground combine.

MR. R. MORRISON, on behalf of the Government, resisted the amendment, which, he said, would unduly limit the Minister's powers.

MR. H. MORRISON also opposed the amendment, contending that in the present state of London traffic it was impossible to do without tramcars. Where capital was sunk in an undertaking, such as a tramway undertaking, it was essential to get the utmost out of it. Figures from the provinces showed that per passenger mile the tramway was much more economical than either the omnibus or the railless car.

The amendment was negatived by 23 votes to seven.

VISCOUNT CURZON then moved an amendment to enable the Minister to limit the number of tramcars as well as the 'buses. He objected to the singling out of one particular form of traffic as being entirely responsible for the traffic congestion of London. It was important that the Minister should be able to deal with all forms of traffic from an impartial standpoint.

MR. R. MORRISON, for the Government, opposed the amendment, stating that omnibuses if taken off a certain route could go somewhere else, but the tramcars ran on a permanent way, laid down at great expense and by Act of Parliament.

The amendment was negatived by 18 votes to 15.

The Committee then adjourned.

Commercial Radio International Committee.—On May 15th, Mr. HARTSHORN informed Mr. Baker that he had no information as to the capital of the German member of the Commercial Radio International Committee, but he understood that the authorised capital of each of the remaining members was as follows:—The Marconi Company, £4,000,000; the Radio Corporation of America, $25,000,000; the Compagnie Générale de T.S.F., 62,500,000 fr.

Factory Acts.—On May 15th, during a debate on the Home Office vote, in which Mr. HENDERSON, the Home Secretary, announced the intention of the Government to introduce at an early date a Bill to amend the existing factory legislation and to place inspection on a much broader and more comprehensive basis, Lord H. CAVENDISH-BENTINCK pointed out that the popularity of broadcasting had led to a great increase in the manufacture of electrical accumulators, and the incidence of lead poisoning in their manufacture had greatly increased during the past few years. That, surely, called for adequate inspection. The breaking-up of ships by the oxy-acetylene process was also dangerous, as the great heat applied to the plates generated very strong fumes to the detriment of the workers. This country needed at least 250 factory inspectors.

Manchester Corporation Bill.—The Manchester Corporation Bill was considered by a Committee of the House of Lords, presided over by the Earl of Clarendon, last week. In Part VII of the Bill power is sought to lay tramways and also to run trolley vehicles.

MR. JACQUES ABADY (for the Corporation) said that the Corporation sought power, with the consent of the Minister of Transport, to run trolley vehicles on any road along which it was authorised to construct, but had not constructed, tramways. It also sought power, with the consent of the Minister of Transport, and by agreement with the local authorities concerned, to use trolley vehicles in certain districts outside the City on routes along which the local authority was authorised to construct tramways to be leased to the Corporation, but which had not yet been constructed. If the local authority objected after the Minister had said that consent was unreasonably withheld, however, the Minister should only authorise the running of trolley vehicles by means of a Provisional Order, which must be confirmed by Parliament.

There were a number of petitions against the Bill. The Lancashire County Council objected on the ground that if trolley vehicles were substituted for tramways on routes along which the Corporation already had powers to construct tramways, the Corporation would escape liability for road maintenance, and the extra cost of maintenance occasioned by the use of trolley vehicles would fall on the County Council, whereas if tramways were constructed, the Corporation would be liable, under the Tramways Act, 1870, for the maintenance of a considerable portion of the road. Mr. Abady pointed out that trolley vehicles would be liable to make a contribution towards the maintenance of roads, because they would be taxed in the same way as omnibuses and other vehicles were taxed. Trolley vehicles were cheaper than tramways, and that would be reflected in the fares charged, so that the ratepayers would benefit.

There was also a petition by the County Palatine of Chester, which raised the same objections, and a number of railway companies objected on the grounds of competition.

The Ashton-upon-Mersey and Sale Urban District Councils and the Bucklow Rural District Council, also petitioned, and objected to the powers sought with regard to the substitution of trolley vehicles for tramways. The petition raised the same objection with regard to road maintenance as was raised by the Lancashire County Council, and also pointed out that these local authorities would suffer considerable loss of rating if a trolley vehicle system were substituted for authorised tramways. Strong objection was raised to the clause giving the Minister of Transport power to authorise trolley vehicle routes outside the City by means of a Provisional Order, and it was pointed out that, although such Order would have to be confirmed by Parliament, the fact that it had been made by the Minister would seriously prejudice the local authorities in their opposition to the confirming Bill.

There were also petitions against the Bill by the Failsworth U.D.C., and by the Audenshaw, Denton, Droylesden and Stretford U.D.C.'s, and Barton-upon-Irwell R.D.C., in which similar points were raised.

MR. H. MATTINSON (General Manager, Manchester Corporation Tramways), gave evidence in support of the proposals. The cost of constructing tramways, he said, was now 2½ times what it was before the war. Therefore, they would saddle the undertaking with undue capital expenditure, and it was desirable to postpone the construction of the tramways as long as possible if alternative means of transport could be provided.

MR. J. B. HAMILTON (Manager, Leeds Corporation Tramways), said that the cost of operating trolley vehicles was less

than the cost of operating tramways or omnibuses. There were many places where a tramway would have been a feasible economic proposition before the war, but could not be faced now.

After hearing further evidence, the Committee decided that the section relating to tramways and trolley vehicles should be allowed to proceed, but that the clause giving the Minister of Transport power to authorise trolley vehicle routes should be deleted.

Grampians Electricity Supply Bill.—A House of Commons Committee, presided over by Sir Joseph Hood, dealt last week with the above Bill, the purpose of which is to amend some of the provisions contained in an Act passed in 1922, which authorised the Grampians Electricity Supply Co. to generate electricity by utilising water resources in the Highlands.

MR. CRAIG HENDERSON, K.C., explained to the Committee that the works authorised by the Act of 1922 provided for the damming of Lock Ericht, Loch Rannock, and Loch Garoy, and for the construction of four generating stations. Electric current would be distributed throughout a large area by overhead transmission lines. The Power Securities Corporation had acquired a controlling interest in the company. It had been found, however, that it was necessary to promote the present Bill in order to put right one or two matters which were likely to hamper the success of the scheme. An error had been made with regard to rating, and unless some relief were given, the success of this most important scheme was imperilled from the outset. The promoters asked for a clause providing that, for the purpose of ascertaining the annual value of the lands and heritages of the company, there should be deducted from the gross income of the company an amount equivalent to 7 per cent. on the total sum expended at that time in respect of the appropriation, use, diversion, &c., of water for producing and transmitting power. There was also another clause providing for reductions of assessments in respect of underground water mains and electric works, as well as overhead electric lines and poles, &c.

Under the provisions of the Company's Act of 1922 they would not be allowed to deduct one penny of that capital expenditure for the purpose of arriving at the annual value. In a hydro-electric undertaking they started by capitalising their coal charges for all time. In the case of steam generating stations there was a deduction from gross revenue in respect of coal, and, without the clause asked for in the present Bill, the Grampians undertaking would be at a disadvantage in that respect as compared with a steam undertaking. Being deprived of any deduction, the consequence was that at the first stage of construction, when stations at Loch Ericht and Loch Rannock were completed, and when they would be in a position to earn a gross revenue of £127,000 a year, they would be entered on the valuation roll at £64,000. A steam station, with the same revenue, would have a coal bill of £50,000 annually, and that amount would be deducted from the £127,000. Therefore, unless the relief asked for were given, the public could not be expected to put money into the undertaking. The figure of 7 per cent. on the capital expenditure on water works, &c., at the end of the first stage (£650,000), would give a deduction of £45,500 per annum, against the £50,000 which would be deducted in the case of a steam station. With regard to underground water mains and electric lines, and overhead electric lines and poles, he asked that in burgh rating they should be assessed at a quarter of the annual value entered in the valuation roll, and in respect of county or parish rating, he asked that they should be assessed at half the annual value. The clause in question fixed a time limit of 10 years, after which it was to be left to Parliament to say whether the relief should be extended.

There were petitions against the Bill by the Inverness, Perthshire and Stirlingshire County Councils, by the Burgh of Arbroath, and by the London and North-Eastern Railway.

After hearing evidence, the Committee decided that the 7 per cent. deduction asked for should be reduced to 5 per cent., and that the time limit of 10 years should be reduced to five years.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1922.

18,922. "Electric signalling-transmitters using perforated tape." F. E. Pernot. May 10th, 1923. (214,666.)
28,533. "Means for controlling electrically-operated mechanisms and the like." F. Whipp and Whipp & Bourne, Ltd. October 20th, 1922. (214,667.)
34,502. "Electrodes for welding and like purposes." H. D. Lloyd, C. E. Hill, and Whitecross Co., Ltd. December 18th, 1922. (214,677.)
34,959. "Magneto-electric generators." G. E. Bairsto. December 22nd, 1922. (214,682.)

1923.

1,313. "Sound recordance and reproduction." W. F. Franklin. January 15th, 1923. (214,690.)
1,565. "Thermionic valves." W. A. Brady. January 17th, 1923. (214,694.)
1,587. "Electrically-operated submarine sound-signalling installations." H. Baron (Signal Ges.). January 17th, 1923. (214,695.)
1,621. "Cycle-lighting dynamos." F. Westwood and S. C. Westwood. January 18th, 1923. (214,696.)
1,689. "Construction of commutators for electric machines." J. E. Calverley and W. E. Highfield. January 18th, 1923. (214,698.)
1,880. "Commutator dynamo-electric machines." N. Japolsky and M. Kostenko. January 20th, 1923. (214,702.)
2,065. "Telephone systems." Western Electric Co., Ltd. (Western Electric Co., Inc.). January 23rd, 1923. (214,710.)
2,087. "Process and apparatus for the manufacture of electric wires." Boston Insulated Wire & Cable Co. February 6th, 1922. (192,690.)
2,089. "Systems for operating electric reciprocating motors or the like." Central Electric Tool Co. March 6th, 1922. (194,206.)
2,190. "Differential heat effects produced in conductors by induced currents of electricity." D. F. Campbell. January 24th, 1923. (214,717.)
2,209. "Sound-amplifying devices." P. L. Wostear and R. H. Billingsley. January 24th, 1923. (214,718.)
2,313. "Vacuum electric tubes." E. Y. Robinson. January 25th, 1923. (214,721.)
2,322. "Electric transmission of signals." J. Bethenod. February 2nd, 1922. (192,682.)
2,345. "Wireless receivers." R. K. Spencer. January 25th, 1923. (214,724.)
2,566. "Electrical devices such as variable electrostatic condensers, variable resistances, and the like." W. Dubilier. January 27th, 1923. (214,735.)
2,651. "Method and device for testing materials." H. Baron (Signal Ges.). January 29th, 1923. (214,737.)
2,965. "Electric couplings." H. F. Shanahan. February 1st, 1923. (214,743.)
3,073. "Connections for flexible electric conductors." F. Ryman. February 1st, 1923. (214,744.)
3,465. "Means of disconnecting undesired electric coils or circuits." P. A. McCarry. February 6th, 1923. (214,751.)
3,564. "Method of magnifying intermittent electrical impulses." H. St. G. Anson. February 6th, 1923. (214,754.)
5,026. "Miners' lamps and the like." H. Hallsworth. February 21st, 1923. (Cognate application 29,375/23.) (214,777.)
5,077. "Hopper apparatus for distributing sand or the like on tramway rails." H. A. Forbes. February 21st, 1923. (214,778.)
5,440. "Stationary electrical transformers." S. H. Varnels. November 13th, 1923. (214,780.)
5,459. "Method of producing electros and the like." Dresdensia Matern- und Stereotypie-Anstalt, C. W. Woehler. February 24th, 1922. (193,864.)
6,400. "Telephone receivers." J. W. Dungey. March 6th, 1923. (214,787.)
6,970. "Electrical igniter of photographic flashlight powder, capable of attachment to the case of a pocket electric flash-lamp." J. C. Swan. March 10th, 1923. (214,790.)
7,146. "Voltage-controlling devices for dynamos." G. C. Hubble. March 12th, 1923. (214,793.)
7,536. "Electric burglar-alarms." A. Bogaerd and A. Bocquet. March 15th, 1923. (214,798.)
7,762. "Electric storage batteries." J. F. Monnot. March 17th, 1923. (214,799.)
7,911. "Telephone receiver circuits for radio telegraphy and telephony." G. W. Carpenter and W. La V. Carlson. March 20th, 1923. (214,800.)
8,875. "Phase advancers for dynamo-electric machines." British Thomson-Houston Co., Ltd. (General Electric Co.). March 28th, 1923. (214,811.)
10,135. "Apparatus for controlling vehicles driven by direct-current series-wound electric motors." Akt. Ges. Brown, Boveri et Cie. June 6th, 1922. (198,997.)
10,359. "Method of and apparatus for forming continuous electrodes for electric furnaces." A. Helfenstein. April 16th, 1923. (214,823.)
10,756. "Telephone systems." Western Electric Co., Ltd. June 6th, 1922. (199,000.)
11,137. "Electric trip-switch devices." P. H. Waller. April 24th, 1923. (214,829.)
12,124. "Head-bands for telephones. H. Bertelsen. May 5th, 1923. (214,839.)
13,180. "Crystal detectors for use in wireless telegraphy and telephony." Winfield Bros., Ltd., and C. J. C. Winfield. May 17th, 1923. (214,848.)
13,263. "Acoustic direction-finding apparatus." A. J. Marcelin. July 19th, 1922. (201,145.)
13,431. "Rotary distributors for use in ignition systems for internal-combustion engines." T. Butcher. May 22nd, 1923. (214,849.)
13,777. "Electric cables." J. B. Gall and Callender's Cable & Construction Co., Ltd. May 24th, 1923. (214,852.)
14,368. "Process for the production of arc-light electrodes." Rutgerswerke Akt. Ges. June 9th, 1922. (199,018.)
14,409. "Combined portable electric heater and lamp." P. Rombach. May 31st, 1923. (214,858.)
14,524. "Automatic telephone systems." T. Lenaghan. November 16th, 1922. (Divided application on 200,845.) (214,861.)
14,958. "Electric switches." R. G. Ellis. June 7th, 1923. (214,863.)
16,115. "Railway signalling apparatus of the double wire transmission type." A. G. Kershaw and Westinghouse Brake & Saxby Signal Co., Ltd. June 21st, 1923. (214,869.)
16,116. "Detectors for railway signalling apparatus." A. G. Kershaw and Westinghouse Brake & Saxby Signal Co., Ltd. June 21st, 1923. (214,870.)
16,615. "Variable electric condensers." Eloc Radio Corporation. August 1st, 1922. (201,890.)
16,675. "Receiving apparatus for wireless telegraphy and telephony." W. McClure. June 27th, 1923. (214,876.)
18,319. "Automatic train control apparatus." A. E. Vidal (Otis Automatic Train Control Inc.). July 16th, 1923. (214,886.)
18,380. "Crystal detectors for wireless receiving sets." R. V. Willesford, sen., and R. V. Willesford, jun. July 17th, 1923. (214,888.)
19,445. "Alternating electric current induction meters." Dr. O. T. Blathy. July 29th, 1922. (201,573.)
19,617. "Electrodes for thermionic tubes." Dr. E. F. Huth Ges. August 9th, 1922. (202,300.)
19,638. "Construction of tramway crossings." Aciéries de Genevilliers. August 29th, 1922. (203,311.)
20,240. "Electric discharge tubes with a glow cathode." Naamlooze Vennootschap Philips Gloeilampenfabrieken. February 21st, 1923. (211,885.)
21,761. "Electrically heated melting pots for type-casting machines." T. Bader. August 28th, 1923. (214,901.)
26,140. "Process for rendering porous electrodes impermeable to liquids." Soc. Anon. Le Carbone. February 21st, 1923. (211,882.)
27,015. "Electron discharge devices." Western Electric Co., Ltd. November 27th, 1922. (207,514.)
27,129. "Vapour lamps." W. Barclay. October 30th, 1923. (214,916.)
28,079. "Tapping switches for high-voltage transformers." Akt. Ges. Brown, Boveri et Cie. November 13th, 1922. (206,841.)
29,416. "Electron discharge devices." British Thomson-Houston Co., Ltd. November 21st, 1922. (207,537.)
29,546. "Method of adjustment of apparatus comprising a rotating element for example, electric meters." C. E. J. Brandt, E. A. Foulilleret, and R. M. Fichter. January 4th, 1923. (209,396.)
31,883. "Electrical devices, such as variable electrostatic condensers, variable resistances, and the like." W. Dubilier. January 27th, 1923. (Divided application on 214,734.) (214,929.)

1924.

5,923. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., C. Gillings, and W. O. Passmore. December 19th, 1922. (Divided application on 212,985.) (Cognate application on 5,924/24.) (214,932.)
8,134. "Cooling and ventilating systems for dynamo-electric machines." British Thomson-Houston Co., Ltd., and H. W. Taylor. October 24th, 1923. (Divided application on 28,958/22.) (214,935.)